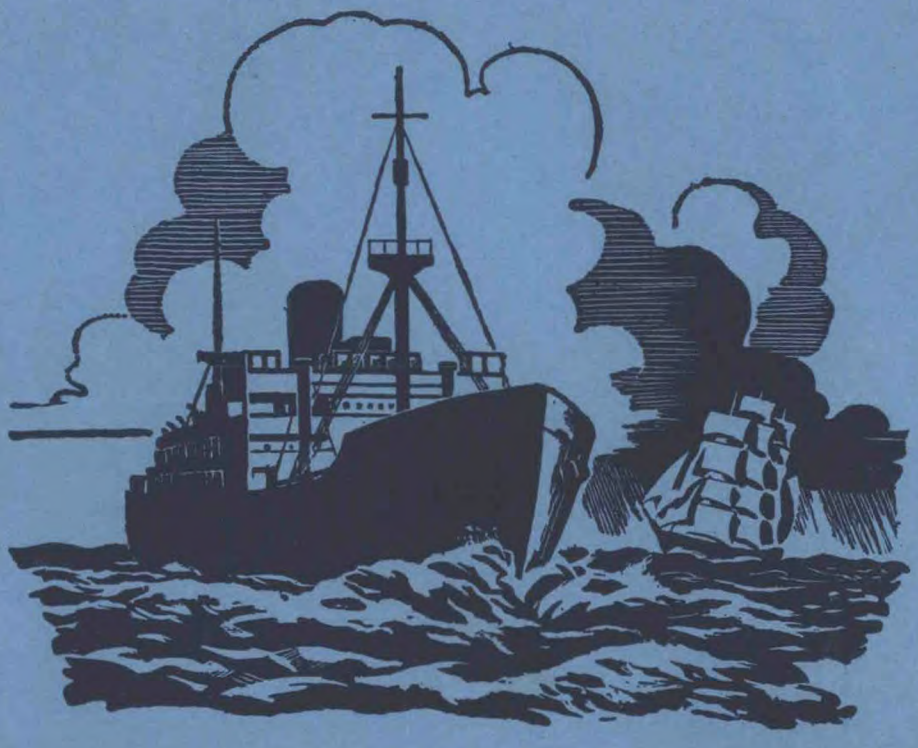
M.O. 697

The Marine Observer

A quarterly journal of Maritime Meteorology



Volume XXXI No. 193

July 1961

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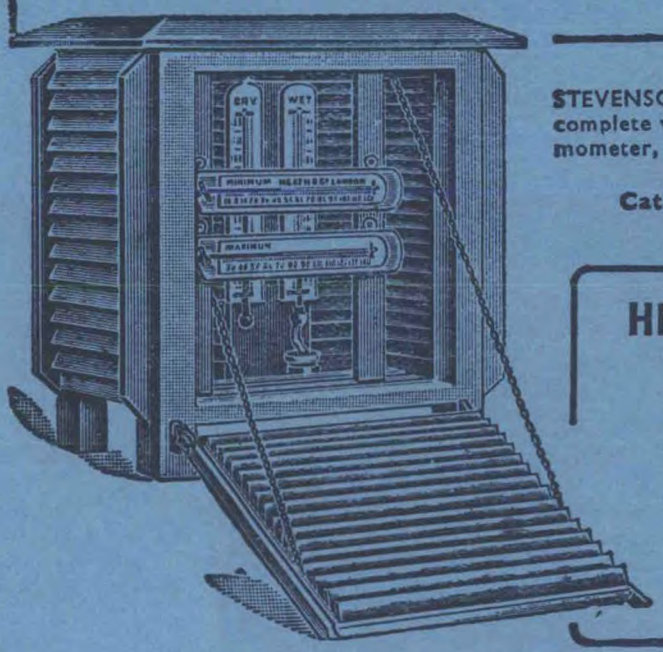

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State of Sea Card

This new Meteorological Office publication, being issued free to all ships of the Voluntary Observing Fleet, has been made possible by the ready response of mariners to the request made to them in 1959 for good photographs for this purpose.

The photographs illustrate the appearance of the sea corresponding to the Beaufort Wind Scale and are intended to aid observers in estimating the strength of the wind in knots when making their routine weather reports. They will also be of benefit to yachtsmen and others, in predicting their state of sea from wind forces given in radio weather bulletins.

The range of wind speed and the mean wind speed are quoted for each force; the description of the sea according to the 'Sea Criterion' laid down by the World Meteorological Organisation is also given.

The card is published by H.M. Stationery Office. It is obtainable either unfolded $21\frac{1}{2}'' \times 14\frac{1}{2}''$, with cord for hanging, at a price of 5s. 0d. (by post 5s. 10d.) (M.O. 688), or as a foldable card, $10\frac{3}{4}'' \times 14\frac{1}{2}''$, price 6s. 0d. (by post 6s. 10d.) (M.O. 688A).

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THE MARINE OBSERVER

A QUARTERLY JOURNAL OF MARITIME METEOROLOGY PREPARED BY THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE

VOL. XXXI No. 193 JULY 1961

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Letters to the Editor, and books for review, should be sent to the Editor, "The Marine Observer," Meteorological Office, London Road, Bracknell, Berkshire

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Editorial

"Man can do so much and so much only as he observes in fact or in thought of the course of Nature, beyond this he neither knows anything nor can do anything." Thus spake Sir Francis Bacon, the fourth centenary of whose birth occurred earlier this year.

History remembers Bacon for many things—if he had no other claim to fame he would always have his place in the age old and interminable discussions on the authorship of Shakespeare's plays—but beyond his famous *Essays*, which for all their classical worth he described "but as the recreations of my other studies", his statesmanship, and his forensic ability which took him to the head of his profession, Lord Chancellor of England, he was first and foremost a thinker and a pioneer in the quest for knowledge.

The teachings of the scientific England of Bacon's younger days were based on the fifteen hundred years old system of Aristotle of elaborating theories without testing them against reality. At Trinity College, Cambridge, when but sixteen years old, Bacon openly declared that his teachers suffered from a naïve science that was grounded on a crude and scanty observation of nature. Thereupon he set himself to free the world from the 'Aristotelian theology', as he termed it, and to devote his energies to the principles of accumulating evidence from accurate observation and experiment, and basing scientific conclusions on actual facts.

He was perhaps the first to see that the systematic development and application of science could lead to an improvement in human life, and he may justly be called the founder of modern inductive reasoning.

His successors in the scientific world have become deeply aware of their debt to him. Many 17th-century thinkers regarded themselves as his disciples and some thirty-five years after his death one of the first practical fruits of his philosophy was the foundation of the Royal Society. More than a hundred and seventy years later, Charles Darwin, in starting his researches into the origin of species, recorded in his notebook that he would proceed on 'true Baconian principles'.

Facts, observation and experiment were the cardinal principles of Bacon's philosophy. Without them, as he said above, man could neither know nor do anything. These principles he followed right up to his death for, when riding on Highgate Hill on a cold day in March 1626, it occurred to him that the snow-covered ground gave him a good opportunity of trying an experiment on refrigeration. He thereupon dismounted, killed a fowl and stuffed it with snow. Suddenly he was struck down by a chill and died in a neighbouring house a few days later.

Facts, observation, experiment. Nearly four hundred years have gone by since Bacon formulated his philosophy, years which have brought many changes in the fortunes of mankind but few in its basic needs. We in the Meteorological Office are acutely aware of this need, for the weather, though perhaps the problem which most affects and vexes every man, may well be the last great riddle which he will be vouchsafed to solve.

Experiment to this end is the province of the scientist. But the facts and observations without which he would be nearly helpless are the province of the voluntary observer at sea.

L. B. P.

Report of Work for the Year ended 31st March 1961

(MARINE DIVISION AND MARINE CLIMATOLOGY SECTION OF THE METEOROLOGICAL OFFICE; VOLUNTARY OBSERVING FLEET AND OCEAN WEATHER SHIPS)

1. Voluntary Observing Ships

The Port Meteorological Officers at London, Liverpool, Southampton, Glasgow and Cardiff and the Merchant Navy Agents at Newcastle, Hull and Leith have done their best between them to visit each Voluntary Observing Ship at least once every three months. Between them they have made over 5,000 visits to Voluntary Observing Ships and shore establishments during the year. In some cases it is difficult to arrange such frequent visits, because the ship concerned may seldom call at a port where there is one of these representatives, or her stay in port may be too short for such a visit to be arranged. The Port Meteorological Officers and Merchant Navy Agents have done their best, with the somewhat limited length of time they get aboard any particular ship, to give the officers instruction and guidance in their voluntary observing duties and to advise them as to meteorological information which is available for shipping. Unavoidable circumstances, such as absence on leave of the regular officers serving in particular ships, make it necessary for more than one visit to be made to many a Voluntary Observing Ship during her stay in port. An effort has been made whenever practicable to see the radio officer, in addition to the observing officers.

The British Voluntary Observing Fleet, as shown in Table 1, has averaged about 670 during the year and is comprised as follows:

(*a*) *Selected Ships*, which are supplied on loan with a full set of meteorological instruments and make complete observations (Code Form F.M. 21A) and transmit them by radio to selected radio stations ashore, wherever their voyages take them.

(*b*) *Supplementary Ships*, which make somewhat less detailed observations than those made by Selected Ships, and are supplied on loan with only a barometer, an air thermometer and screen. They use an abbreviated code form (F.M.22A) for their radio weather messages.

Selected and Supplementary Ships have, as is customary, noted in their meteorological logbooks useful observations of sea surface currents and ice. Without these observations the preparation of current and ice maps would be impossible. Aurora observations have been regularly recorded and many ships have sent in observations of whales for the National Institute of Oceanography. The wide variety of observations of natural phenomena which have been received is evident from the "Marine Observers' Log."

(*c*) *Coasting vessels* (*'Marid' Ships*) which make sea surface temperature observations when in British coastal waters and transmit them in a brief code to British coast stations (by W/T or R/T). When in the North Sea, these ships include in their reports wind, weather and visibility observations to meet the needs of meteorologists in various countries bordering that sea.

(*d*) *Light-vessels*, which make observations of wind, waves, visibility and air and sea temperature. Eleven of these send coded reports by R/T; the other three merely record the observations for climatological purposes. (Reports from *Dowsing*, *Galloper* and *Royal Sovereign* light-vessels are included in the B.B.C.'s '5-minute weather bulletins for shipping'.)

(*e*) *Trawlers*, which make visual observations (no instruments being needed) and transmit them by W/T and R/T (in Code Form F.M.23B) to radio stations in the United Kingdom, Canada, Iceland or Norway as convenient (depending on the area in which they are fishing).

	1960									1961		
	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
Table 1. Number of British Observing Ships												
No. of Selected Ships	480	478	479	480	487	487	490	496	488	492	492	493
No. of Supplementary Ships	55	54	51	51	50	48	47	47	47	48	48	48
No. of 'Marid' Ships*	82	84	84	89	93	100	101	101	101	101	101	103
No. of Light-vessels	14	14	14	14	14	14	14	14	14	14	14	14
No. of Trawlers	30	30	28	28	30	30	27	25	20	20	21	19
Table 2. Ships' Radio Weather Messages received at Dunstable												
No. reporting to Dunstable:												
British Selected and Supplementary Ships	310	314	311	312	295	301	314	312	326	297	292	293
Daily average of messages—												
Atlantic	96	93	94	88	84	91	95	99	89	85	94	84
North Sea†	11	8	9	9	9	11	10	9	10	9	10	10
*British 'Marid' Ships**	44	53	48	47	52	53	52	57	45	50	49	60
Daily average of messages—												
Atlantic	11	10	11	10	10	11	10	9	6	7	10	10
North Sea†	5	6	6	6	6	6	6	7	5	6	6	6
Foreign Ships	283	305	291	290	286	284	287	272	290	308	271	330
Daily average of messages	28	29	29	30	30	29	31	34	29	30	30	32
Light-vessels	11	11	11	11	11	11	11	11	11	11	11	11
Daily average of messages	34	35	33	33	33	34	35	35	34	34	34	35
Trawlers	19	23	20	22	28	28	27	21	15	16	16	15
Daily average of messages—												
Atlantic	9	14	13	17	16	16	14	9	5	8	8	10
North Sea†	5	3	4	5	5	5	3	5	3	3	2	3
Total number of messages per day from the North Sea area†	21	17	19	20	20	22	19	21	18	18	18	19

* Vessels in the short sea trades recruited for the purpose of observing and transmitting sea surface temperatures.
† The North Sea between 51° 30′–61°N, 4°W–7° 30′E.

(*f*) *Auxiliary Ships.* These ships are only asked to make and transmit meteorological observations by radio when in areas where shipping is sparse. Their observations are similar to those made by trawlers, but with the addition of pressure and temperature readings using the ship's own instruments.

The total number of U.K. Selected and Supplementary Ships has averaged about 540, out of a world total of about 2,500.

Table 2 shows that a daily average of over 100 messages has been received at the Meteorological Communications Centre at Dunstable from British ships in the eastern North Atlantic. The network from this ocean area thus continues to be generally satisfactory, but it is obvious that in the North Atlantic, as in other oceans, there are largish gaps at times where there doesn't happen to be any ship; this is unavoidable.

The number of radio weather messages received at Dunstable from trawlers has decreased from 760 per month in 1959–60 to 466 per month this year. This is not due to a lack of interest on the part of trawlers, but to the fact that they are now making great use of foreign radio stations, whereas previously nearly all of these reports were transmitted direct to British stations. Actually, the total number of reports transmitted by British trawlers indicates an increase this year, being an average of 845 per month.

Foreign-going voluntary observing ships continued to be encouraged to maintain their observations in coastal waters whenever ships' duties permitted. There was a small increase, compared with last year, in the number of observations received from the North Sea area (see Table 2).

There are no definite statistics as to the number of reports transmitted by British ships in other areas, except the Hong Kong area, where the monthly number of reports to Hong Kong averaged 116 during the year. Records received from British ships show they do send their observations regularly as provided for in the international scheme.

The British Voluntary Observing Fleet includes ships of over 100 shipping companies, and covers all the trade routes of the world (as shown in Table 3). The contribution which these ships make to world meteorology is thus considerable.

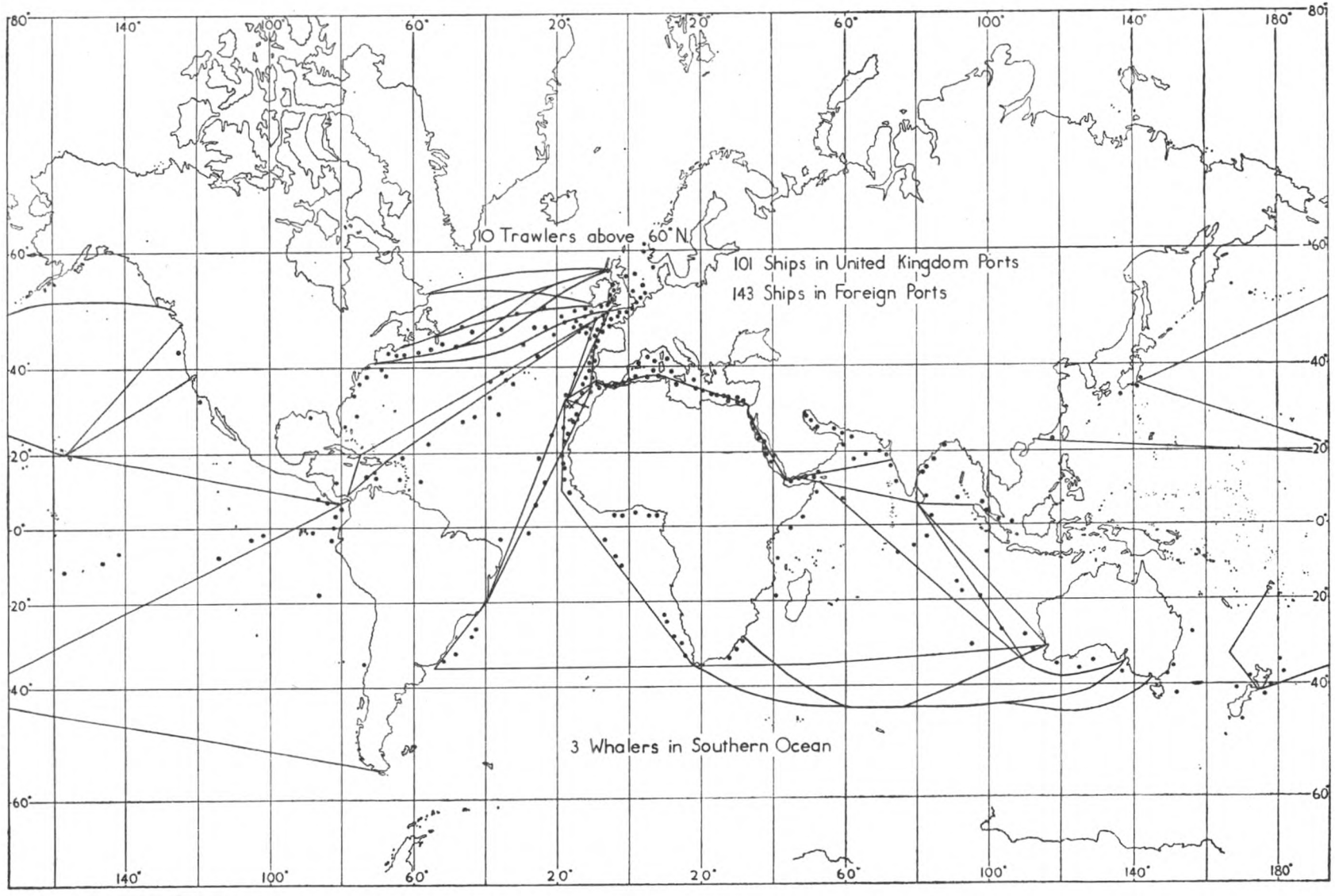
The observations received in the Meteorological Office in the logbooks from British Voluntary Observing Ships, and those taken from the teleprinter messages sent in by trawlers and coasting vessels, have been punched on to cards and have thus been made available for climatological work and for answering enquiries.

Table 3. Numbers of British Selected Ships on main routes from and to the United Kingdom

Australasia	112	Atlantic coast of S. America	31
Far East	46	Pacific coast of S. America	9
Persian Gulf	18	Pacific coast of N. America	8
S. Africa	24	Europe, mainly northern Europe	16
N. Atlantic	83	Falkland Is. and Antarctic	5
W. Indies	19	World-wide 'tramping'	88

2. Ocean Weather Ships

The British weather ships completed 13 years of service in the North Atlantic during the year. In September the former anti-submarine frigate H.M.S. *Amberley Castle*, after conversion to an ocean weather ship by a shipyard at Blyth, was renamed *Weather Adviser* by Lady Sutton in a little ceremony at Greenock shortly before her maiden voyage as a weather ship (see *The Marine Observer*, January 1961). This ship replaced the 'Flower' class vessel *Weather Observer*, which was the



The position of British ships which made observations on 1st March 1961 (a day picked at random).

first British weather ship to occupy an ocean station in the North Atlantic in August 1947. *Weather Observer* did an excellent job throughout her thirteen years' service. She has now been sold. *Weather Adviser* and her sister ship *Weather Reporter* are proving successful as weather ships in service, and their larger size permits better accommodation. The two 'Flower' class vessels still in service are expected to be replaced during 1962 by two other former 'Castle' class frigates, at present undergoing conversion at Blyth.

During the year our ocean weather ships operated in rotation with the French and Netherlands ships at Ocean Stations 'A' (62°N, 30°W), 'I' (59°N, 19°W), 'J' (52° 30'N, 20°W) and 'K' (45°N, 16°W). Observations of water temperature gradient using a bathythermograph, and radiation observations using a solarimeter, were continued aboard all four ships in addition to routine surface and upper air observations, including radio sonde and radio wind to an average height of 60,000 feet. Aboard *Weather Reporter*, wave observations using the electric wave recorder were continued.

R.A.F. aircraft of Coastal Command carried out, during the year, as they have done for many years, frequent air/sea rescue exercises with the ocean weather ships. These, under the Code Name of "MET HOP", provide useful practice for the aircraft and the ships' personnel—but they also provide the opportunity for mails to be dropped to the ships in watertight buoyant containers. At times urgently needed stores or spare parts are 'dropped' to the ships on these flights. If a delicate instrument has to be dropped, as occasionally happens, a parachute is used. Coastal Command aircraft have become very expert at dropping these containers close alongside a ship. The containers are dropped close to the ship and picked up by a grapnel, or by boat if weather permits.

Plankton and sea surface samples were obtained for the Ministry of Agriculture, Fisheries and Food and for the Department of Agriculture and Fisheries for Scotland. The weather ships continued to carry out their other duties in providing information and navigational aid to transatlantic aircraft, and to shipping when required.

3. Marine Climatology and Enquiries

In November 1960, as an indirect result of the report of the Committee under the Chairmanship of Lord Brabazon which reviewed the activities of the Meteorological Office in 1957, certain changes were made in the structure of the Meteorological Office, preliminary to the move of the office to a unified Headquarters at Bracknell. One of the results of this reorganisation is that responsibility for marine climatology, which has been handled by the Marine Division since 1855, has now been taken over by the Climatological Services Division of the Meteorological Office. The reason for this change is that climatology has now developed into a rather more exact mathematical study than in previous years, and also because it was felt preferable to have all climatological studies on the surface of the world (over the land and over the oceans) in one Division. Another change that has taken place is that the punched-card installation, which has been in the Marine Division since 1921, has been moved to a new Assistant Directorate of the office, which will deal with all questions of "data processing". It was in the Marine Division, in 1921, that punched cards were first used for the processing of climatological data, because it was realised that owing to the mobility of ships, this was the only practicable method of dealing statistically with such observations. The use of punched cards was extended to upper air climatology in 1945 and was gradually extended thereafter to other Divisions of the Meteorological Office and is now widely used throughout the office. While the punched-card installation remained at Harrow, it was convenient for it to remain under the Marine Division, although it was rapidly becoming a 'pool' for the use of the whole office, but the greatly increased scope of its activity, and the number and complexity of the problems that now have to be dealt with, made it necessary, once the move to Bracknell took place, to transfer it to the newly formed Division

which will specialise in work of this nature. The Marine Division of the Meteorological Office will continue to carry out its other activities as in the past, and marine data, after having been carefully scrutinised in the Marine Division, will be extracted from the logbooks and placed on punched cards for climatological purposes as previously.

The number of logbooks received during the year was 1,094 from Selected and Supplementary Ships and ten from Auxiliary Ships. Logbooks and upper air data were also received from weather ships operating at stations A, I, and J, as the Meteorological Office is the official authority for the climatological treatment of observations at those three stations. Microfilm copies of observations made at other ocean stations have also been received. All the above observations have been punched on to cards as soon as possible after they have been received in the Office.

The computation of wave height frequencies for 5° squares of latitude and longitude for each month for all ocean areas was completed.

An investigation into the downward penetration through the atmosphere of snowflakes (before melting), using data from North Atlantic ocean weather ships, was completed, and a paper written on this subject.

Work continued with the tabulation of radiation records made by British ocean weather ships during the year, in a form suitable for punching on to cards; this had also to be done in the form required by the IGY Meteorological Data Centre, Geneva.

A memorandum was written on the subject of forecasting sea fog in the Western Approaches. Some progress was made with computations of the mean pressure, air and sea temperatures, for individual months over the last 90 years for each 2° latitude by 5° longitude 'square' in the North Atlantic between 30° and 60°N in connection with an investigation into climatic fluctuations in this period.

The steady increase in the number of enquiries dealt with over the past few years has continued. Information was supplied to government departments, meteorological services of other countries, scientific institutions, shipping companies, commercial firms and private individuals. Charges were made for supplying the information, when appropriate. The following are examples of the range covered:

Information of lowest sea temperatures, and associated air temperatures, around the coast of the U.K., were supplied to the Search and Rescue Section of the Air Ministry, in connection with the problems of survival at sea.

Sea temperature data off Tarapur Point (India) were supplied to an electrical company in connection with the design of cooling equipment for a proposed power station.

Wind data were supplied to the Royal Radar Establishment (Ministry of Aviation) in connection with the design of radar equipment.

Extremes of air temperature between the U.K. and Australia were supplied to an aircraft firm who were to transport a rocket to Woomera.

Information of weather and sea waves between Southampton and Lisbon was supplied to a holiday organisation.

A private enquirer studying for his 1st Mate's certificate was supplied with information regarding currents, trade winds and pressure systems.

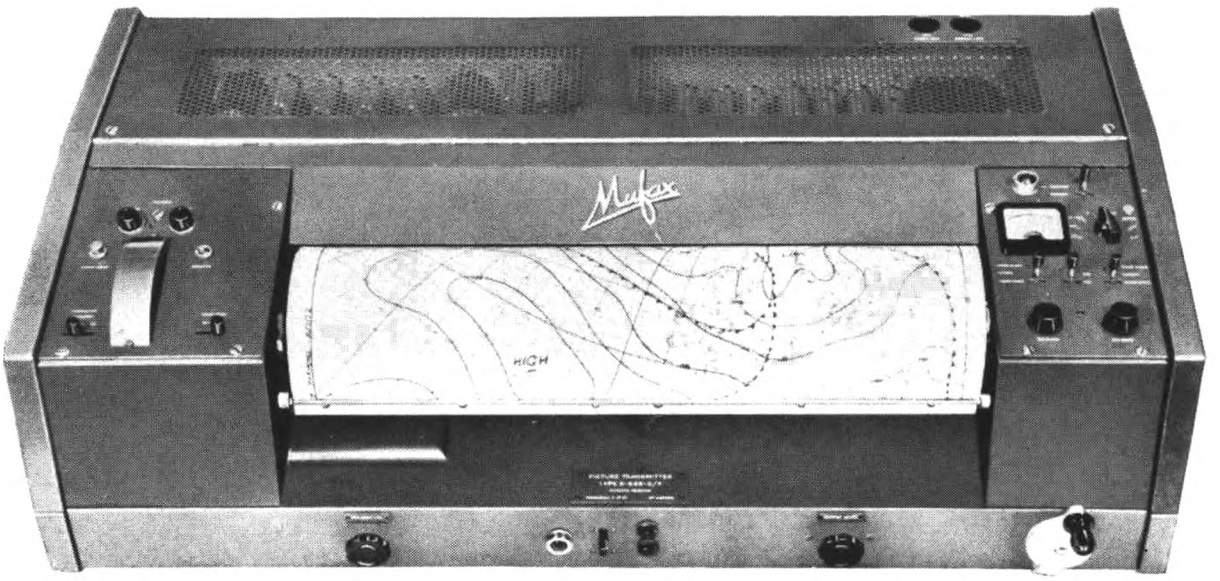
Information was supplied to the Ministry of Transport for a number of formal enquiries into shipping casualties involving loss of life. Several enquiries were received from underwriters and shipping officials regarding ice conditions in the North Atlantic, the Gulf of St. Lawrence and the Baltic.

4. Currents and Ice

Completion of computation for a revised edition of *South Pacific Ocean Currents* is now in sight. The currents and ice information of six volumes of Admiralty Sailing Directions were revised during the year and Surface Current Notes for 23 Admiralty Charts were checked and revised where necessary.

Monthly ice maps were plotted for use within the Meteorological Office and by oceanographic and fishery research institutes; they also assisted in answering enquiries from shipowners.

(*Opposite page 112*



By courtesy of Muirhead & Co., Ltd.

One type of facsimile transmitter.

By courtesy of Muirhead & Co., Ltd.

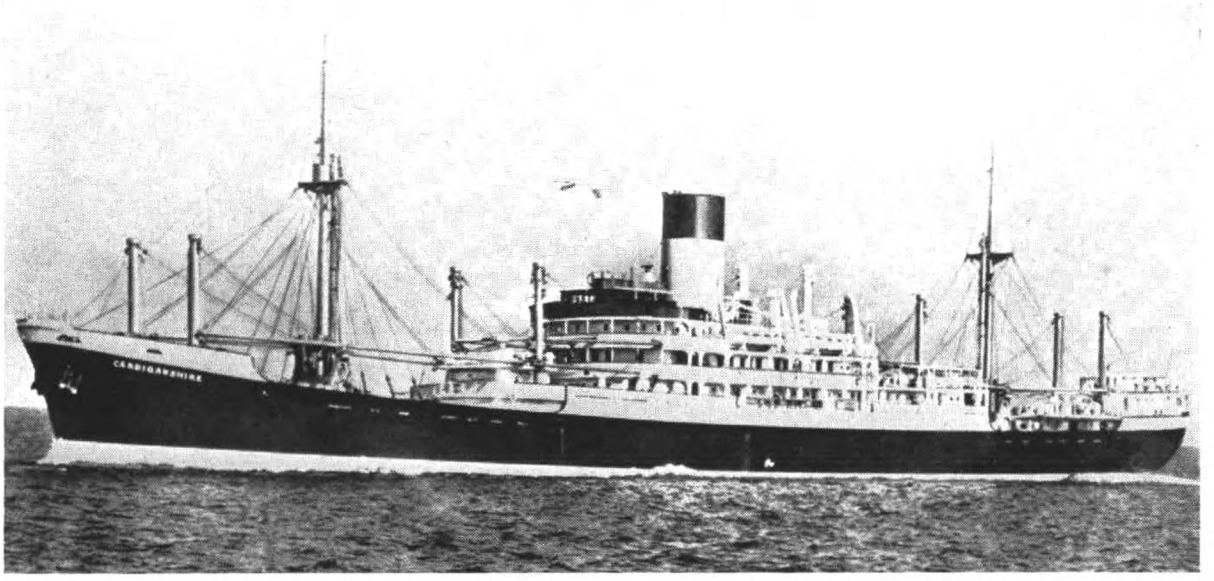
One type of facsimile recorder.

FACSIMILE APPARATUS FOR TRANSMITTING CHARTS BY RADIO OR LAND-LINE (see page 139).

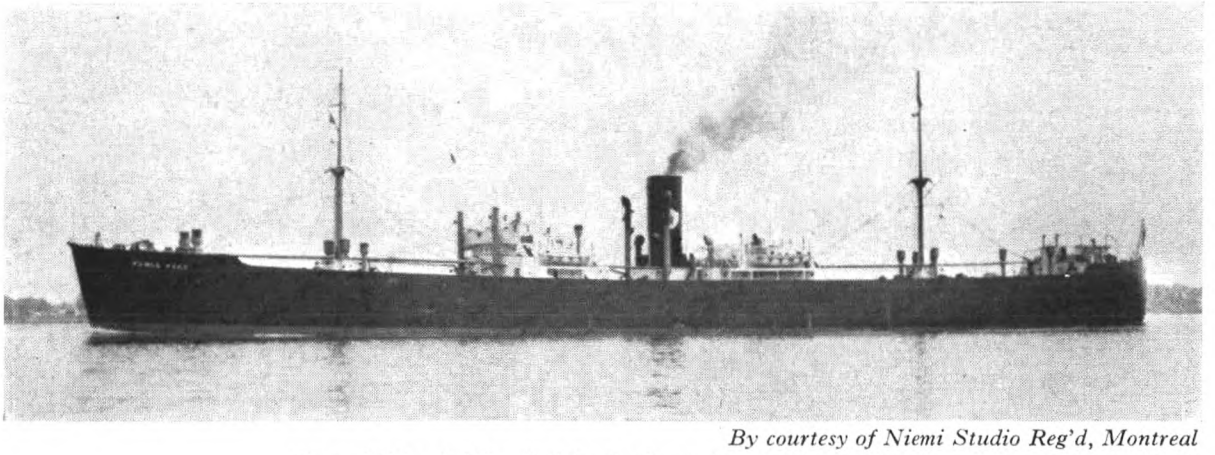
(*Opposite page 113*)

By courtesy of Skyfotos

Apollo (Bristol S.N. Co., Ltd.), Captain G. V. Barnes.



Cardiganshire (Glen Line), Captain R. T. Harries



By courtesy of Niemi Studio Reg'd, Montreal

Fanad Head (Head Line), Captain J. Alexander.

THE THREE SHIPS WHICH GAINED THE HIGHEST MARKINGS FOR METEOROLOGICAL LOGBOOKS DURING THE YEAR ENDED 31st MARCH, 1961 (see page 113).

5. Publications

(*a*) *The Marine Observer* was published quarterly.
(*b*) A new atlas, *Quarterly Surface Current Charts of the Eastern North Pacific*, was published.
(*c*) A new item, *State of Sea* card, containing photographs of the appearance of the sea corresponding to each of the forces 0–12 on the Beaufort wind scale, was published.

6. Awards

Resulting from a detailed examination of meteorological logbooks received during the year from voluntary observing ships, Excellent Awards are being presented to the master, principal observing officer and radio officer aboard those ships whose records received during the year came in the first 100 in order of merit. (See pages 113 to 117.) The books selected as Excellent Awards are *Under the Deep Oceans*, by T. F. Gaskell, and *The University Atlas*. Similar awards are also being made to two trawlers and two coasting ('Marid') vessels, the basis of their awards being the number of observations received from the ships by radio.

Barographs were presented during the year to four masters of British Selected Ships for consistently good meteorological work over a long period (see *The Marine Observer*, October 1960).

EXCELLENT AWARDS, 1960-1961

The list of ships, captains, principal observing officers and radio officers from whom, during the year ended 31st March 1961, we have received meteorological logbooks of such a high quality that they have qualified for an Excellent Award, is published on pages 114 to 116 of this issue.

Every July issue of *The Marine Observer* since 1924 has contained such a list and once again it is our very great pleasure to congratulate those named in it. This is not to belittle the efforts of the four hundred or more voluntary observing ships who are not named. Many of these ships have sent in logbooks which have been classed as 'excellent', and the personal record card which we keep for every officer bears that annotation on it. But we are limited to 300 awards to Selected and Supplementary Ships in each financial year, which means that only the best 100 ships can receive awards.

For the seventh successive year, we publish in this article a 'short list' of those ships who sent us the best meteorological logbooks during the year. They are:

1. *Apollo* (Bristol S.N. Co., Ltd.), Captain G. V. Barnes.
   Cardiganshire (Glen Line), Captain R. T. Harries.
   Fanad Head (Head Line), Captain J. Alexander.
2. *Gloucester City* (Bristol City Line), Captain E. Irish.
   Hertford (Federal Line), Captain H. C. R. Dell.
   Logna (Chr. Salvesen & Co., Ltd.), Captain L. B. Anderson.
3. *Cape Franklin* (Lyle Shipping Co., Ltd.), Captain P. Farmborough.
   Gothic (Shaw Savill Line), Captain L. J. Hopkins.
   Lismoria (Donaldson Line), Captain R. McNie.
   Rangitata (New Zealand Line), Captain A. Hocken.
   Zinnia (J. Robinson & Son), Captain W. R. Hunter.

This is the second appearance of *Apollo*, *Lismoria* and *Rangitata* in an annual short list, the two former being in consecutive years. The customary photographs of the three best ships appear on opposite page, and it is interesting to note the wide differences between these three ships: a deep sea carrier on the Far East run, a Western Ocean trader and a small coaster. To us, this seems to exemplify the uniform keenness and enthusiasm of officers in all types of ships and in all trades. This is further emphasised by the awards to 'Marid' ships (vessels in the short sea trade taking and transmitting sea temperatures only) and trawlers, listed on page

EXCELLENT AWARDS (Year ended 31st March, 1961)

Ship	Captain	Principal Observing Officer	Senior Radio Officer	Owner/Manager
Aaro	W. C. Gill	J. V. Hatfield	F. Nicoll	Ellerman's Wilson Line
Albany	R. D. Jones	D. W. H. Peirce	G. Gannon	Royal Mail Lines
Alsatia	J. W. Stamper, M.B.E.	M. H. Tinsdale	J. S. Bishop	Cunard Line
Apollo	G. V. Barnes	W. R. Kays	R. Pearce*	Bristol S.N. Co., Ltd.
Athenic	G. H. Heywood	T. M. Ffowes-Williams	H. Knight	Shaw Savill Line
Baron Glenconner	J. Pearson	W. G. Todd	K. O'Kelly	Hogarth Line
Birmingham City	F. R. Neil	P. J. Wright	A. B. Pilkington	Bristol City Line
Bristol City	J. N. Ramsay	M. J. Winter	T. M. Jenkins, M.B.E.	Bristol City Line
Britannic	R. J. N. Nicholas, R.D.	C. Walker	J. Kidson	Cunard Line
British Advocate	J. H. Jones	D. G. Ashurst	D. O'Shea	B.P. Tanker Co., Ltd.
British Consul	T. H. Evans	A. A. Beattie	J. R. Weston	B.P. Tanker Co., Ltd.
British Sailor	S. Watson	A. E. Sainty	J. McRory	B.P. Tanker Co., Ltd.
Brittany	M. Larrive	F. G. Nickson	P. Kelly	Royal Mail Lines
Cairndhu	G. H. Percy	W. E. Brown	W. P. Greives	Cairn Line
Cairngowan	I. G. Foster	R. H. Sinclair	E. Johnston	Cairn Line
Caledonia	D. Blair	D. Barclay	J. McConnell	Anchor Line
Caltex Canberra	P. J. Davies	P. H. Jones	K. P. Tyrrell	Overseas Tankships (U.K.) Ltd.
Caltex London	J. Gillies	P. A. Denham	R. Small	Overseas Tankships (U.K.) Ltd.
Cape Franklin	P. Farmborough	J. McPhedran	R. O'Connor	Lyle Shipping Co., Ltd.
Cardiganshire	R. T. Harries	S. Barnes	K. Bent	Glen Line
Cato	H. G. Mowat	A. S. Phillips	N. J. Llewelyn†	Bristol S.N. Co., Ltd.
Ceramic	F. A. Smith	N. J. Case-Green	R. O'Shaughnessy	Shaw Savill Line
Cheshire	A. N. Williamson	S. J. Goodchild	G. Waller	Bibby Line
Clan Macdonald	H. D. T. Lockyer	D. C. W. Wellstead	D. McNeil	Clan Line
Clan Mackinnon	H. J. Freestone, M.B.E.	A. K. Deacon	J. Cox	Clan Line
Columbia Star	J. T. Lowe	A. J. Fordham	J. Brett	Blue Star Line
Consuelo	R. Cudbertson	E. C. Methan	J. M. Mahon	Ellerman's Wilson Line
Crofter	W. E. Williams	J. M. Connolly	A. D. Fraser	Harrison Line
Cymric	H. C. Smith	D. Comer	W. Charlton	Shaw Savill Line
Dartmoor	A. H. Brown	N. McDonald	C. J. Ardiff	Runciman Line
Dominion Monarch	K. D. G. Fisher, G.M.	A. C. Reed	R. Crompton	Shaw Savill Line
Dorset	F. C. Taylor	L. E. Howell	T. Hirst	Federal Line
Dunedin Star	R. H. Stark	P. V. J. Sanders	J. Lamb	Blue Star Line
Dunera	L. W. Scott	H. Black	W. C. G. Sturgess	British India Line
Durham	R. Hollingdale	J. Crowder	F. Wilson	Federal Line
Edenmore	A. Wiles	M. J. Ratcliffe	E. Dickson	Furness Lines

Essex	S. W. Andrews	G. Webber	L. Sutton	Federal Line
Explorer	E. A. Bruce	P. S. Burn	J. Steven	Dept. of Agric. & Fisheries for Scotland
Fanad Head	J. Alexander	J. S. Hanna	R. Shepherd	Head Line
Gardenia	J. H. Gray	G. Richardson	A. Gregor	J. Robinson & Son
Glitra	S. Sutherland	J. Walgate	D. Corbett*	Chr. Salvesen & Co., Ltd.
Gloucester	J. S. Laidlaw	M. J. Collins	W. Henderson	Federal Line
Gloucester City	E. Irish	M. F. Williams	M. Brett	Bristol City Line
Gothic	L. J. Hopkins	R. Dyer	B. McGovern	Shaw Savill Line
Hadrian Coast	W. G. M. Wyness, M.B.E.	A. Thain	P. M. Bowie*	Aberdeen S.N. Co.
Hector	R. A. Hanney	B. G. Lloyd	A. Torrance	A. Holt & Co.
Hertford	H. C. R. Dell	M. Elsam	W. Kay	Federal Line
Hesione	R. D. Helme	M. W. Ryan	W. McParlin	Houston Line
Hororata	C. P. Robinson	M. Hodgkinson	J. Hewitt	New Zealand Line
Huntingdon	J. Guyler	J. Lewis	N. Fawcett	Federal Line
Jason	J. Gould	D. L. Cockin	J. L. Brooksbank	A. Holt & Co.
John Biscoe	W. Johnston	J. L. Pattison	I. Williams	Falkland Islands Govt.
Kirkham Abbey	H. H. Fox, M.B.E.	R. Carmichael	B. C. Boot*	British Transport Commission
Laurentia	T. S. Graham	C. Campbell	D. Murray	Donaldson Line
Leicestershire	E. D. Brand	R. M. Ellison	J. E. Unsworth	Bibby Line
Lindisfarne	G. Robison	K. Scollay	W. Johnson	W. A. Souter & Co., Ltd.
Lismoria	R. McNie	R. Brewster	J. Limpitlaw	Donaldson Line
Logna	L. B. Anderson	T. W. Lawrence	G. Reid*	Chr. Salvesen & Co., Ltd.
Magdapur	J. Richardson	D. J. Lewis	D. F. Lawrence	Brocklebank Line
Manchester Port	F. Lewis	K. Hunter	A. Hindle	Manchester Liners
Manchester Progress	W. E. G. Oliver	A. Pickering	J. Kane	Manchester Liners
Marna	J. Clark	J. Carnie	J. B. Kerr*	Chr. Salvesen & Co., Ltd.
Menastone	S. F. Sheasby	G. F. Hogg	R. Taylor	Stone & Rolfe Ltd.
Merchant Duke	S. E. Hooper	R. Young	N. E. Wynne	Drake S.S. Co., Ltd.
Milo	J. N. Thatcher	S. Church	J. F. Tremlett*	Bristol S.N. Co., Ltd.
Mirror	G. Garrett	R. M. D. Wright	G. A. O'Brien	Cable & Wireless Ltd.
Newfoundland	L. J. Kew	R. W. Holmes	J. Keegan	Furness Lines
Nottingham	H. J. D. Sladen	A. J. Ward	R. H. Morris	Federal Line
Orion	S. Ayles, R.D.	P. J. Shepherd	F. Harrop	Orient Line
Otaio	K. Barnett, R.D.	J. H. Hutson	P. H. Broome	New Zealand Line
Perim	W. H. Waghorn	J. A. Graham	W. Potter	P. & O. Line
Perseus	W. K. Hole	D. I. Drummond	R. J. Hinchcliffe	A. Holt & Co.
Perthshire	E. W. Jenkin	R. C. Toogood	F. Anderson	Scottish Shire Line
Pipiriki	F. S. Angus	J. B. B. Ashford	S. L. Adams	New Zealand Line
Port Fairy	H. B. Conby	B. Queree	J. P. Hannon	Port Line
Port Hardy	R. L. Hagley	E. H. Jones	G. C. Talbot	Bibby Line

* Deck Officer † Relieving Master

Ship	Captain	Principal Observing Officer	Senior Radio Officer	Owner/Manager
Port Lincoln	E. J. H. Arnold	J. F. Sheldrake	W. Cowie	Port Line
Port Macquarie	A. J. Hawkins	I. B. Rankin	F. D. Lawton	Port Line
Port Pirie	L. J. Skailes	C. H. P. Brown	J. F. Reilly	Port Line
Port Vindex	E. W. R. Young	J. Burtt	N. Hodgeson	Port Line
Port Wyndham	R. H. Finch	D. Atkinson	J. S. Clark	Port Line
Port Townsville	J. S. Moate	J. M. S. Spence	E. Loft	Port Line
Potaro	C. H. Weightman	B. J. Hotter	R. Passmore	Royal Mail Lines
Rakaia	F. G. Bevis	C. M. Turner	R. Birkenshaw	New Zealand Line
Ramore Head	S. T. Ross	D. A. Chinn	H. McGurk	Head Line
Rangitata	A. Hocken	M. Eglon	J. Skirrow	New Zealand Line
Rhodesia Castle	J. B. James	D. France	R. Cullen	Union Castle Line
Rialto	H. Greenhill	R. L. Cole	A. C. Gavin	Ellerman's Wilson Line
Romanby	E. A. Snaith	K. D. Mowat	J. Lewis	Sir R. Ropner & Son Ltd.
Southern Cross	L. H. Edmeads	B. L. A. Jeffries	H. Matthews	Shaw Savill Line
Trecarrell	I. M. Price	J. M. F. Barnett	F. Curran	Hain S.S. Co., Ltd.
Trelawney	H. Gravell	G. R. Crease	H. Gilchrist	Hain S.S. Co., Ltd.
Trelevan	W. H. Whitaker, M.M.	I. W. Sheales	C. Hall	Hain S.S. Co., Ltd.
Trelissick	C. A. McKay	R. C. Lister	E. Salmon	Hain S.S. Co., Ltd.
Trelyon	G. M. Lloyd	J. Carmichael	E. D. Bridgeman	Hain S.S. Co., Ltd.
Tremorvah	C. E. Pratt	D. R. Mitchell	D. Powell	Hain S.S. Co., Ltd.
Trevean	L. Annett	D. J. Hunkin	C. G. Cluett	Hain S.S. Co., Ltd.
Velletia	J. H. Hamling, O.B.E.	J. K. Frost	G. Barling	Shell Tankers Ltd.
Willowpool	C. H. Churchill, O.B.E.	T. Jones	M. A. Bennett	Sir R. Ropner & Son Ltd.
Zinnia	W. R. Hunter	S. Hyland	D. R. Uglow	J. Robinson & Son

MARID SHIPS*

Brenda	J. McKinnon	J. B. Hunt	W. L. Muir‡	Dept. of Agric. & Fisheries for Scotland
Princess Margaret	J. F. D. Hey	T. R. Cree	J. J. D. Sheil	British Transport Commission

* Vessels in the short sea trades recruited for the purpose of observing and transmitting sea surface temperatures. ‡ Deck Officer.

TRAWLERS

Skipper	Wireless Operator	Ship	Owners
J. Dobson	K. H. Massey	*St. Loman*	Thos. Hamling & Co., Ltd.
B. C. Wharam	L. Hought	*Prince Charles*	St. Andrew's Steam Fishing Co., Ltd.

116, whose contribution, though unspectacular and seldom highlighted in the pages of *The Marine Observer*, is nevertheless a very great help in the preparation of weather forecasts for the use of shipping and the general public, for the study of weather around the home coasts and in far northern waters.

Noteworthy, too, is the fact that the awards are this year shared amongst the ships of 46 shipping companies. Whilst it is almost inevitable that the larger companies will lift the greatest number of awards because of the size of their observing fleets, it is by no means only the larger companies which gain places in the short list.

The recipients of the awards will be individually notified by letter and asked for an address to which they would like us to send it. Correspondence with ships is, however, subject to many delays which may be prolonged when an officer has recently changed his ship. If, therefore, an officer sees his name in the list before he receives the official letter, we would be glad if he would write to us (noting that we are no longer at Harrow, but at London Road, Bracknell, Berkshire), claiming the award and giving us an address to which he would like it sent.

We mentioned last year that we had found that a world atlas was by far the most popular award and that we had adjusted our buying so that there was now a reasonable prospect of the first award to any officer being an atlas, and that some of our 'regular customers', who had not hitherto received an atlas, would now get one. There may, however, be officers who, for a variety of reasons, do not want an atlas but would rather have a book. If there are, we would be glad if they would let us know.

L. B. P.

THE MARINE OBSERVERS' LOG

July, August, September

The Marine Observers' Log is a quarterly selection of observations of interest and value. The observations are derived from the logbooks of marine observers and from individual manuscripts. Responsibility for each observation rests with the contributor.

UNUSUAL CURRENT SET
Gulf of Aden

m.v. *Egidia*. Captain G. Ramage. Bedi-Bunder to Aden. Observer, Mr. D. Bisset, 3rd Officer.

7th July 1960. Between noon and 1557 ATS the vessel experienced a set which was unusually strong for the area being traversed. A radar fix from Ras Baghashwa gave the vessel's noon position as 14° 13′ 30″N, 50° 07′ 30″E. The course being steered was 247°. At 1557 the log reading was 56·6 miles and the D.R. position was 13° 52′W, 49° 14′ E, but the actual position was 13° 54′ 30″N, 49° 29′ 30″E, obtained by a radar fix from Burum. It would therefore appear that the set experienced was 083° at 3·75 kt., and this continued until 2000 on the same day. The vessel is on a regular run between the U.K. and India, and this particular route is always followed, but such

an unusual set has never been experienced before in this area. The wind was WSW, force 6, and the sea was also from the same direction. The sea temp. was 83°F.

Note. It is of course the strength of this current that is unusual; this must be one of the strongest currents reported from this part of the Gulf of Aden during July, although it is not the first four knot current report from the Gulf during the southwest monsoon.

CALM PATCH
North Atlantic Ocean

s.s. *Gloucester City*. Captain E. Irish. Norfolk, Va., to Avonmouth. Observer, Mr. J. M. Dawson, 2nd Officer.

3rd September 1960. At 1700 GMT, the vessel, on a course of 062°, approached a stretch of almost calm water about 300 yd. wide which extended in a NNE–SSW direction as far as the eye could see. The wind, which had been NNW, force 4, increased to force 6 as the vessel neared the calm patch, but over the quiet water it died away. On the other side, the wind freshened from the same direction as before, to force 6, and later moderated to force 4. Whilst in the calm water there were only ripples of the surface and these moved in a direction opposite to the crests raised by the force 6 wind. The steering of the vessel was in no way affected. Air temp. 61°F, sea 67°.

Position of ship: 41° 24′N, 64° 33′W.

Note 1. Dr. L. H. N. Cooper, of the Marine Biological Association of the United Kingdom, comments:

"There is little doubt that the calm patch marked some kind of convergence at the boundary between the Gulf Stream and the colder coastal water. It is in an area much studied by the Woods Hole Oceanographic Institution and in June 1950 was included within 'Operation Cabot', the multiple ship operation which showed how extremely complicated this boundary may be.

"The pattern of winds suggests that some kind of cellular connection of the air overlay the convergence. Ships furnished with thermographs for measuring sea surface and air temperatures could further help by sending in their fully annotated records, so that the two may be compared in detail. Sharp changes are always likely at the convoluted boundaries between different water masses.

"Observations on surface dross, such as sargassum weed, may also be of value; so may 'negative' observations such as the one here that the steering was in no way affected.

"Records from merchant ships are of great value in filling the gaps when research ships are not about and may provide the stimulus for well-based research programmes."

Note 2. The fluctuations of wind which were of short duration were probably random variations caused by large-scale eddies. However, when an air mass encounters a large fall in the temperature of the sea below it, there is an increase in the stability of the lowest layers, and 'damping down' of atmospheric turbulence. It is therefore possible for the observed variations in wind to be associated physically with the calm patch.

UPWELLING PHENOMENA
off Cape Guardafui

m.v. *Cardiganshire*. Captain R. T. Harries. Singapore to Aden. Observers, the Master and all officers.

15th July 1960. A line of current rips, lying E–W and about 5½ miles long, was observed at 0900 GMT off Cape Guardafui.

In spite of a SW wind of force 6, the line was clearly marked by breaking water: it was also plainly seen on the radar screen at a distance of five miles. There was a large change in sea temperature across the line: on the south side the reading was 73·9°F, while on the north side it was 86·4°.

Position of ship: 11° 50′N, 51° 22′E.

Note. This is a useful observation of sea conditions in the vicinity of the intensive upwelling of cold water off East Africa south of this position.

s.s. *Perim*. Captain W. H. Waghorn. Singapore to Aden. Observer, Mr. J. A. Graham, 4th Officer.

28th September 1960. At 0600 GMT (0930 SMT) the air temperature was 78°F and the sea 72°, values which were comparable with those read at this time over the last few days. By 0640 the air temperature had risen to 86°, an increase of 8°, while the sea temperature rose by 14°, also to 86°. These new temperatures remained steady until the vessel reached Aden.

Position of ship: 11° 55′N, 51° 41′E.

Note. These highly variable sea and air temperatures are also associated with the extensive upwelling of the sea that occurs off East Africa to the south of this position. Ocean current measurements would have been of great interest in giving the movement of surface waters. Water that has upwelled is cold, and likely to be moving north-eastward.

m.v. *Worcestershire*. Captain H. Davies. Trincomalee to Aden. Observer, Mr. M. Ford, 3rd Officer.

30th September 1960. On rounding Cape Guardafui at 0830 GMT the air temperature rose from its previous value of 76°F to 88°; the sea temperature rose by a similar amount, changing from 74° to 86°. The increase of temperature ceased when the vessel was 10 miles to the west of Guardafui. At 0600 the wind was SSW, force 5, but at noon it was N, force 3.

Position of ship at 0600: 11° 42′N, 51° 54′E.

Note. This is a further interesting report of sea and air temperature fluctuations associated with water that has upwelled. (See above reports from m.v. *Cardiganshire* and s.s. *Perim*.)

m.v. *Cardiganshire*. Captain R. T. Harries. Aden to Penang. Observers, Mr. H. B. Gobey, 2nd Officer and Mr. S. Barnes, 3rd Officer.

26th September 1960. At 1300 GMT the vessel ran into what proved to be a series of fog patches, the largest of which was some 8 miles long, approx. ½ mile wide and 150–200 ft. in thickness: it lay in a NNE–SSW direction. None of the other patches approached this one in size, and most could be likened to very small fair weather Cu. clouds at sea level. The air temp. remained unchanged at 79·6°F, the wet bulb at 76·7° and the sea temperature at 75·8° as the vessel traversed the area, the time occupied being about 15 min. Wind SW's, force 3. Sky cloudless.

Position of ship at noon: 11° 54′N, 52° 06′E.

Note. The fog reported above is almost certainly associated with the upwelling of cold water. The upwelling takes place off East Africa to the south of this position and flows north eastwards.

Pacific Ocean

m.v. *Ajana*. Captain J. D. Blake. Balboa to Noumea. Observers, the Master and Mr. M. S. Dixon, 2nd Officer.

2nd September 1960. At 2030 GMT the ship passed through a current rip lying approximately 080°–260° and curving away in a southerly direction. The rip, which was about ½ mile wide, was marked by rippling, breaking waves, patches of discoloured water and a profusion of small birds. It was noticed that the birds seemed to be settling on the water in and around the discoloured patches. In the previous 24 hours the ship had experienced a set and drift of 264°, 38 miles. Sea temp. 73°F. Wind SE'S, force 4.

Position of ship: 0° 39′N, 101° 29′W.

m.v. *Ajana*. Captain J. D. Blake. Balboa to Noumea. Observer, Mr. D. Williams, 3rd Officer.

3rd September 1960. For a period of 20 min around 0400 GMT the vessel crossed and recrossed, several times, a well-defined line of demarcation lying in a general direction of 180°–360°. There was bright moonlight at the time, and the sea on the

north side of the line was seen to have an oily appearance, though nevertheless confused and choppy. On the south side, the sea presented an entirely normal appearance; the wind was SSE, force 2. When the Aldis lamp was directed on to the sea surface, the water on the north side looked cloudy or milky, but to the south side it was clear. Flecks of phosphorescence could be seen where the Aldis beam touched the water. These were bright orange in colour (similar to the light of a sodium lamp), and were noticed in both the cloudy and the clear water, but they were most in evidence at the line of demarcation. Sea temp. 71°F.

Position of ship: 0° 13′N, 102° 52′W.

Note. These two observations are probably associated with the division between the cold water that has upwelled off Peru and the water of the South Equatorial Current. The colouring of the water, the phosphorescence, and the presence of birds, appear to confirm this. They all indicate biological activity.

UNUSUAL SEA WATER ODOUR

Red Sea

s.s. *Mandasor.* Captain A. B. Davies. Suez to Aden. Observer, Mr. J. D. Read, 3rd Officer.

22nd July 1960. At 0930 GMT a strong odour was noticed coming off the surface of the sea, and later on, during the afternoon, a number of dark brown patches of discoloured water were seen. The smell occurred intermittently until about 2200 when it reached its greatest intensity: it was very strong indeed at this time and continued to be so for half an hour or more. Sea temp. 88°F. On the previous day at 1130 GMT, in position 21° 00′N, 30° 07′E, a similar patch of discoloured water about 100 ft. wide was noticed stretching from E to W as far as the eye could see, but on that occasion there was no smell at all. The sea temp. was 87° and the wind calm.

Position of ship at 0930 on 22nd: 17° 24′N, 40° 24′E.

DISCOLOURED WATER

South Pacific Ocean

m.v. *Port Brisbane.* Captain E. E. Roswell. Balboa to Auckland. Observer, Mr. J. D. Cartwell, 3rd Officer.

19th August 1960. At 1445 GMT the vessel passed through bands of discoloured water which were 10 feet wide and spaced at intervals of 100 ft. They were yellow ochre in colour and lay in almost parallel lines in a 300°–120° direction for a distance of at least one mile on either side of the vessel. The discoloration seemed to be due to fragments of matter about ¼ to ½ in. in size suspended in the water just below the surface. Sea temp. 69°F. Wind SSE, force 3. Low s'ly swell.

Position of ship: 3° 22′S, 98° 25′W.

Indian Ocean

m.v. *Benvannoch.* Captain J. P. Robertson. Aden to Penang. Observers, the Master, Mr. W. Watson, Chief Officer, Mr. G. W. Walker, 2nd Officer and Mr. R. Gavine, 3rd Officer.

27th August 1960. At 0700 GMT the vessel entered an area of approximately 25 square miles in which the sea surface was a bright luminous red colour: the coloration was in bands running in a N–S direction and the substance responsible was found, on taking samples, to lie from the surface to a maximum depth of 6 ft. Sea temp. 82°F. Wind W, force 3.

Position of ship: 7° 23′N, 75° 27′E.

Note. Dr. T. J. Hart, of the National Institute of Oceanography, comments:

"The red colour suggests swarms of *Noctiluca milaris*, a large (2 mm.) Dinoflagellate that is also *one* of the causes of phosphorescence by night, but other microscopic Dinoflagellates and protozoa can cause a similar appearance. A particularly good sample of *Noctiluca* was obtained by s.s. *Clan Maclay* on 3rd November 1956 in position 7° 00′N, 78° 42′E.

ALBATROSS
Great Australian Bight

m.v. *Otaki*. Captain J. D. Bennett. Fremantle to Adelaide.

13th May 1960. At 0715 an albatross was sighted, red ringed on its left leg. Position of ship: 35° 18′S, 119° 48′E.

Note 1. On page 98 of the April 1960 number of *The Marine Observer* we mentioned that the New South Wales Albatross Study Group were now ringing albatross with a red band of reflecting aluminium, and asked any ship sighting these birds to record the fact in their meteorological logbooks. This, being the first such report we have received, is published here, though its proper place would have been the April 1961 number had it been received in time.

Note 2. Mr. W. B. Hitchcock, Secretary of the Australian Bird-Banding Scheme, comments:

"We are indebted to Captain Bennett for his report on the albatross sighting: would you please convey our thanks to him?

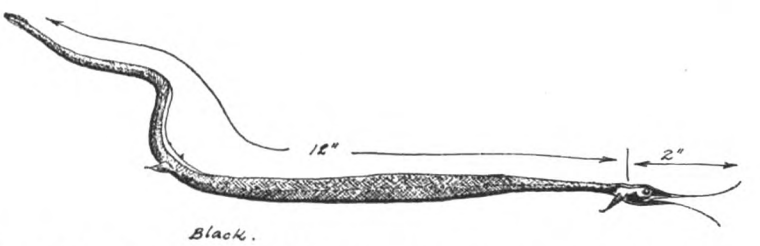
"Since 1956 nearly 1000 wandering albatrosses have been caught and banded at sea off Bellambi and Malabar, New South Wales. Of these, one has been reported from Bird Island, South Georgia, and one from Marion Island, South Indian Ocean. Also, two birds banded by British biologists at South Georgia have been recaptured off Bellambi.

"The bird reported in Captain Bennett's log would have been banded at Bellambi between 4th July and 20th August 1959."

FISH
North Atlantic Ocean

c.s. *Mirror*. Captain G. Garrett. Observer, Mr. R. M. D. Wright, 2nd Officer.

The drawing below, by Mr. Wright, is of a creature that came aboard the ship, wrapped around the grappling rope, during cable operations off the Canary Islands in July 1960.



Note. Mr. N. B. Marshall, of the Natural History Museum, comments:

"This is a deep-sea snipe eel of the family *Nemichthyidae*. These eels are widely distributed in deep waters of the sub-tropical and tropical oceans."

DEAD FISH
North Atlantic Ocean

s.s. *Clan Buchanan*. Captain J. L. Jones. Dakar to Valencia. Observers, Mr. G. Allson, Chief Officer, Mr. B. Hockley, 2nd Officer and Mr. W. Marshall, 3rd Officer.

1st September 1960. At 1700 GMT, dead fish, several hundred in number and covering a large area, were seen floating on the surface of the sea. They appeared to be about 10 in. long and some 2 lb. in weight and bore a marked resemblance to the whiting found in Home Waters. Air and sea temp. 70°F. Wind NNE, force 5. Depth 50 fm.

Position of ship: 24° 30′N, 16° 24′W.

Note 1. Mr. N. B. Marshall, of the Natural History Museum, comments:

"This observation is interesting but the causes of fish mortality are not properly understood. In the Arabian Sea for instance, the mortality may be due to a lack of oxygen or noxious planktonic plants, or to both. When such observations are made it might be helpful if some note is taken of the colour of the sea (is it discoloured by 'red tides' or 'water blooms' and so on)."

Note 2. We have in the past received several observations of fish mortality. On page 30 of

the January 1959 number of *The Marine Observer* we published the observations of seven ships who, between January and October 1957, witnessed this phenomenon in the Arabian Sea. On that occasion Mr. Marshall gave his opinion that it was clear that great quantities of fish, perhaps amounting to several million tons, died in the north-western Indian Ocean in 1957.

Observations of fish mortality off the West Coast of Africa have been rarer and those that we have received have hitherto been confined to the month of March. Great mortality occurs in this region every year from February to April. In 1929 for instance, the public health authorities called on military aid to clear the beaches in the region of Hann; and in February 1944, 150 tons of fish were found in the dry dock at Dakar, after it had been pumped out.

The observation from the *Clan Buchanan* would seem to indicate that the mortality is not confined only to the spring months.

JELLYFISH

Barents Sea

s.s. *Menastone*. Captain S. F. Sheasby. London to Archangel. Observer, the Master.

7th–8th July 1960. While on passage northward, from Lodingen through Indreleia, large numbers of jellyfish were seen which varied in size from 2 in. to 15 in.

Position of ship at 0000 on 8th: 70° 00′N, 20° 36′E.

Note. Dr. W. J. Rees, of the Natural History Museum, comments:

"The jellyfish which m.v. *Menastone* encountered in passage through Indreleia, Norway, in July 1960, was probably the Lion's Mane, *Cyanea capillata L.*, a common amber or golden-coloured species in the northern waters of the Eastern Atlantic. On the Scandinavian coasts these medusae are budded off from bottom-dwelling minute polyps (relatives of sea anemones) in coastal waters from January onwards. In early May they are 2-6 in. in diameter and continue to grow to a large size—average examples having a disc diameter of about 18-20 in. are common in the autumn.

"These medusae are largely coastal in distribution and are more easily seen in the calmer waters of fjords or between sheltered islands. It is therefore not surprising that they were sighted in this particular position.

"*Cyanea capillata* is regarded as a moderate stinger—it is this species that gave Conan Doyle the idea for the story of *The Adventure of the Lion's Mane*."

PHOSPHORESCENCE

South Pacific Ocean

s.s. *Pipiriki*. Captain F. S. Angus. New Plymouth, N.Z., to Balboa. Observer, Mr. R. J. Lott, 4th Officer.

10th August 1960. At 0130 GMT, when the vessel was proceeding through smooth water shortly after sunset, phosphorescence was observed. The crests of the bow wave were sharply delineated and there were patches of phosphorescence, either single or in groups, within the wash caused by the vessel. The brightest patches resembled twigs in shape, approximately 12 in. long, and it was from the ends of these 'twigs' that the most brilliant blobs of light were emitted. The colour varied from a light green to a whitish green, the latter shade being the brightest. In addition to the patches, there were masses of small specks which produced a dull glow. After the moon rose at 0348 further observation became impossible. Sea temperature 75°F. Wind calm.

Position of ship: 16° 19′S, 106° 39′W.

North Pacific Ocean

m.v. *Seattle Star*. Captain L. W. Evans. Balboa to Los Angeles. Observer, Mr. A. R. Redclift, 3rd Officer.

12th August 1960. Between 0200 and 0300 GMT the phosphorescence in the sea was particularly noticeable. The crests of waves breaking some considerable distance from the ship could be clearly seen and the ship's wake was also very pronounced. There was no moon and yet the whole area around the ship was considerably lighter than on a normal moonless night. Sea temp. 80°F. Wind SSE, force 3–4.

Position of ship: 10° 40′N, 88° 47′W.

off Tocopilla

s.s. *Cuzco*. Captain R. B. Bryant. Iquique to Tocopilla. Observer, Mr. M. Ratcliffe, 3rd Officer.

10th September 1960. Very marked phosphorescence was seen in the form of lines which appeared to be spinning round in a circular movement until dispersed by breaking waves. Sea temp. 61°F. Wind S'W, force 5. Moderate SW'ly swell.

Indian Ocean

s.s. *Leicestershire*. Captain E. D. Brand. Aden to Colombo. Observers, Mr. P. Saunders, Chief Officer and Mr. A. R. Burton, Junior 3rd Officer.

12th September 1960, between 1300 and 1430 GMT. Parallel bands of phosphorescence were observed lying in an ESE–WNW direction. They were about 10 yd. wide and 50 yd. apart and stretched for several miles. The phosphorescence was accompanied by a strong smell of fish. Sea temp. 81°F. Wind WNW, force 4. Moderate sea and swell.

Position of ship: 7° 30'N, 77° 00'E.

BLUE FLASHES AT SUNSET

South Pacific Ocean

s.s. *Gothic*. Captain L. J. Hopkins. Cristobal to Wellington. Observer, Mr. M. Jenkins, 4th Officer.

2nd August 1960. Two flashes, kingfisher blue in colour, were seen at 0040 GMT as the sun went down behind a layer of Ac., and another occurred as it reappeared in a break in a bank of Cu. The flashes were observed through prismatic binoculars, kept in readiness in anticipation of the occurrence. Air temp. 71°F, wet bulb 68°, sea 71°. Wind SE, force 4.

Position of ship: 3° 46's, 96° 20'W.

Note. This is an example of abnormal refraction of the sun's rays, and is a similar phenomenon to the green flash. The blue colour was probably associated with absence of scattering of blue light in a very clear atmosphere.

A blue flash as the sun reappears is very unusual—the reappearance of the lower limb is usually associated with a red flash. But some special distribution and/or movement of the cloud may have caused the upper limb to appear again on the second occasion.

GREEN RAYS AT SUNSET

North Atlantic Ocean

m.v. *Silverdale*. Captain G. F. Chivers, M.B.E. Amuay Bay to Hamburg. Observers, Mr. W. Frith, 2nd Officer, Mr. M. Brisley, 3rd Officer, Apprentices J. Harrison and C. Harrison, and Mr. J. Elliot, Purser Chief Steward.

25th August 1960. Just after the sun had set at 2230 GMT, five diverging green rays of light were seen radiating from a position on the horizon which bore 260°. The middle ray was the brightest one and it terminated at an elevation of about 18°; the other four were much fainter and extended only to about 5°. They were all visible for just over half an hour and completely disappeared by 2315. Along the horizon there was a line of detached Cu. which appeared grey against the background of the sky; just above the clouds the sky was a bluish colour and this shade merged smoothly into a greenish tint a few degrees above the horizon. The green, in turn, faded evenly into the yellow above it which terminated at an elevation of about 13°: beyond the yellow coloration was the normal blue of the sky. See sketch opposite page 128. Air temp. 83°F, wet bulb 78°, sea 80°. Visibility excellent. $\frac{2}{8}$ Cu.

Position of ship: 27° 00'N, 54° 51'W.

Note. It has not been possible to identify this interesting display. It is similar to crepuscular rays. The sun's light appears to have been selectively refracted and scattered. See *Marine Observer's Handbook*, page 73.

LUNAR RAINBOW WITH SECONDARY ARC
South Pacific Ocean

s.s. *Gothic*. Captain L. J. Hopkins. Cristobal to Wellington. Observers, all deck officers, 2nd Radio Officer and cadets.

8th August 1960. Shortly after the full moon rose at 0400 GMT, a lunar rainbow was seen in light drizzle over a period of approximately one hour. It varied in intensity, being mainly pale and colourless, but occasionally green, yellow, red and purple coloration was in evidence. A complete semicircular bow of 41½° radius was seen, and when this was at maximum intensity a colourless secondary arc could be discerned about 5° outside the primary. The horizon inside the bow was indistinct, but outside, it was well defined. Altitude of moon, 5 to 15°. Air temp. 64°F, wet bulb 62°. Wind ESE, force 4.

Position of ship: 25° 32′S, 132′ 12′W.

Note. This phenomenon is very rare, particularly the secondary bow, which appears to be very faint and only apparent when the primary bow is at its maximum intensity. The indistinct horizon inside the bows was probably due to diffraction of light by very small atmospheric water drops with diameters of the order of the wavelength of light.

TRIPLE RAINBOW
South Pacific Ocean

m.v. *Cheshire*. Captain A. N. Williamson. Balboa to Brisbane. Observer, Mr. G. Tully, 4th Officer.

29th July 1960. A very well defined portion of a triple rainbow which persisted for 3 min. was seen at 0700 SMT. It then gradually became a double, then a single rainbow before finally fading out. There were no gaps between the bows, the three of which made a continuous band from about 8° to 21° above the horizon. No precipitation was seen to reach the surface during the period of observation. Air temp. 64°F, wet bulb 56°, sea 70°.

Position of ship: 26° 22′S, 133° 31′W.

Note. These appear to be a section of a band of supernumerary rainbows together with the primary bow. An account of the distribution of colour in the bows would have been of interest.

RED FLASH AT MOONRISE
South Pacific Ocean

m.v. *Rangitoto*. Captain L. W. Fulcher. Wellington to Callao.

10th August 1960. Moonrise was observed through the bridge telescope and a brilliant red flash was seen for 2 sec. as the lower limb cleared the horizon, which was free from cloud. Visibility was excellent. Air temp. 65°F, wet bulb 62·5°, sea 66·9°. Wind NW′N, force 3. Sea slight. ⅜ Sc.

Position of ship at 0600: 20° 12′S, 90° 06′W.

Note. Red flash is rare, and one at moonrise seen so clearly must be extremely rare. The very clear atmosphere, and great abnormal refraction, must have been essential conditions for the observation. (See also *The Marine Observer*, January 1956, page 16.)

COUNTERGLOW
South Australian waters

m.v. *Dartmoor*. Captain A. H. Brown. Adelaide to Melbourne. Observers, Mr. T. W. Hughes, 3rd Officer and Mr. G. Turnhill, Apprentice.

5th August 1960. Between 1715 and 1725 LMT when the sun set, a bright red glow was seen on the reverse bearing, in the east. The glow was most intense when the sun's lower limb touched the horizon, and it was sufficiently bright to blot out

the low sand dunes of the coast line. The sky was $\frac{7}{8}$ covered with Ac., Cc. and some small Cu. Air temp. 53°F. Visibility excellent.

Position of ship: 8 miles SE of Port Macdonnell.

Note. This is an interesting and complex phenomenon and is probably caused by very intense back scattering of the sun's light.

AURORA

The following notes have been received from Mr. James Paton, of the Aurora Survey:

"The observations of aurora made in ships during the period 1st July-30th September 1960 are listed in the accompanying table compiled at the Balfour Stewart Auroral Laboratory of the University of Edinburgh, where they are charted along with data from observers on land and in aircraft. There were no outstanding aurorae during this period, although some ships obviously saw very colourful displays. We are very grateful to those who have provided this information, and also for the accompanying sketches."

Date (1960)	Ship	Geographic Position	Λ	Φ	I	Time (GMT)	Forms
15th July	*Tremorvah*	46°53′N 57°45′W	010	58	+72	2350–0650	L, RA, RB, S, F, C,P
	Dilwara	49°42′N 03°30′W	080	53	+65	2300–2350	R
16th	*Loch Loyal*	34°50′N 42°00′W	030	45	+72	0100–0130	G, R
	Martand	33°08′N 51°30′W	020	44	+65	0110–0135	R
	Cairnforth	42°30′N 62°30′W	010	60	+72	0100–0600	HA, RA, S
17th	*Bristol City*	41°03′N 65°50′W	360	53	+72	0400–0600	HA, PA
29th	*Ripon*	51°00′N 56°00′W	020	63	+75	0100–0600	HB, DR, S
	Kawatari	46°07′S 170°24′E	250	−51	−70	1520–1600	HA, R
12th Aug.	*Ramore Head*	52°24′N 53°36′W	020	63	+75	0400–0800	All forms
14th	*Weather Reporter*	58°55′N 18°50′W	070	65	+72	2330	RA
16th	*Weather Reporter*	59°00′N 19°00′W	070	65	+72	2300	RA
17th	*Weather Observer*	52°36′N 20°36′W	060	59	+69	0300	L
	Weather Reporter	58°55′N 18°57′W	070	65	+72	0400	RA
	Crofter	50°38′N 11°25′W	070	55	+67	2124, 2220	G, R
	Weather Reporter	59°01′N 19°18′W	070	65	+72	2200	R
18th	*Weather Reporter*	59°01′N 19°18′W	070	65	+72	0100	HA
	Weather Observer	52°30′N 20°06′W	060	59	+69	0300	L
	Empire Star	43°00′N 70°00′W	360	54	+73	0600, 0750	HA, R, F, S
20th	*Haparangi*	45°17′S 171°27′E	250	−38	−70	0810–0835	G, RA
22nd	*Consuelo*	56°30′N 41°30′W	040	66	+75	0100–0112	C
	Weather Reporter	59°05′N 18°40′W	070	65	+72	0230	G, R
29th	*Rakaia*	44°31′N 28°21′W	050	53	+65	0500–0600	G, R
	Weather Reporter	58°58′N 19°08′W	070	65	+72	2230	HA, RA
30th	*Weather Reporter*	58°58′N 19°08′W	070	65	+72	0014–0027	PA
	Torr Head	47°42′N 42°30′W	030	58	+69	0100–0530	G, RA, C, F
	Woodford	48°00′N 72°00′W	350	60	+76	0300	DR
31st	*Woodford*	48°35′N 62°35′W	010	60	+74	0300	DR
3rd Sept.	*City of Winchester*	47°49′N 60°53′W	010	59	+74	0430–0730	RB, R, P
	Toronto City	50°38′N 58°26′W	020	62	+76	0500, 0750	L, RA, C, S
5th	*Britannic*	47°30′N 44°00′W	030	58	+70	0230–0310	HA, R, S
6th	*Manchester Regiment*	52°00′N 62°00′W	010	62	+76	0200–0245	HB
11th	*Weather Recorder*	58°36′N 19°24′W	070	65	+72	0200–0215	HA, RB
13th	*Weather Recorder*	58°30′N 19°30′W	070	65	+72	0100–0330	G, RB, HB
14th	*Weather Recorder*	58°51′N 19°25′W	070	65	+72	0410–0440	G, F
	Menastone	69°50′N 20°00′E	120	67	+77	0001–0300	RA, RB, R, P
	Menastone	70°24′N 22°12′E	120	67	+77	2130–2330	RA, RB
16th	*Weather Recorder*	58°17′N 19°43′W	070	65	+72	0300–0330	G
17th	*Port Pirie*	40°34′N 70°01′W	360	52	+72	0130	R
	Manchester Regiment	50°00′N 64°15′W	010	61	+75	0300–0340	RA, HA
	Ripon	53°54′N 41°53′W	040	63	+72	2240–0100	G, HB
18th	*Weather Recorder*	59°04′N 19°07′W	070	65	+72	0100–0400	G, HB, S, F
20th	*Manchester Regiment*	50°00′N 64°15′W	010	61	+75	0130–0145	RA
21st	*Weather Recorder*	59°09′N 18°12′W	070	65	+72	2200	G, R
22nd	*Weather Recorder*	59°12′N 18°02′W	070	65	+72	0240	G, R
						2200	G
23rd	*Weather Recorder*	59°20′N 18°05′W	070	65	+72	0001–0245	G, R
						2345	G
	Ripon	50°36′N 58°31′W	010	62	+75	0730	HB, DR, R, SR, F
24th	*Weather Recorder*	59°02′N 18°24′W	070	65	+72	0200–0420	G, RB, HB,
						2230–0515	G
	Port Pirie	48°34′N 68°44′W	360	60	+76	0548–0640	R, C, F, P
	Media	40°17′N 71°34′W	350	52	+71	0500–0715	G, R
25th	*Norfolk*	48°08′N 61°37′W	010	60	+74	0050–0200	G, R
27th	*Media*	48°50′N 47°16′W	030	59	+70	0140–0510	G, RA, HA, R, F, S
29th	*Consuelo*	52°36′N 53°21′W	020	63	+75	2240–2255	HA, RA, C
	Menastone	65°02′N 35°03′E	120	60	+75	2100	R
	Weather Recorder	57°12′N 12°00′W	070	65	+70	2115–0430	G
30th	*Menastone*	65°02′N 35°03′E	120	60	+75	0030–0045	G, RA
	Media	55°19′N 15°12′W	070	61	+70	0140–0255	G, R
						0400–0450	
	Consuelo	52°20′N 53°40′W	020	63	+75	0001–0340	G, RA, RB, DR, C

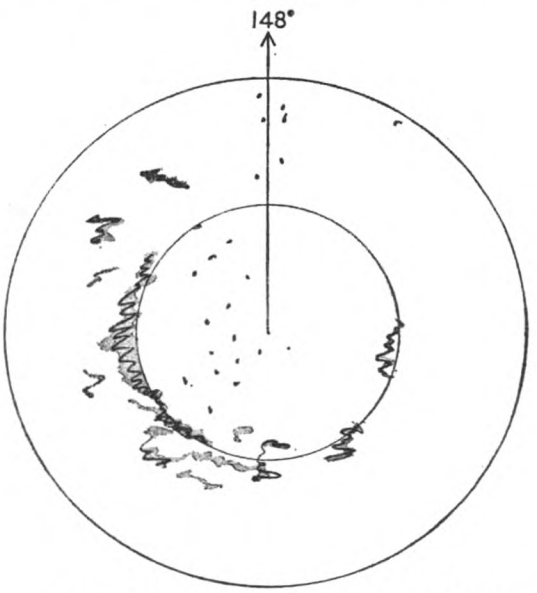
Λ = geomagnetic longitude Φ = geomagnetic latitude I = inclination

(See explanation of magnetic co-ordinates in *The Marine Observer*, July 1960, page 147.)

SANDSTORM SHOWN BY RADAR
Red Sea

s.s. *City of Coventry*. Captain G. Stewart. Suez to Djibouti. Observer, Mr. D. D. Turner, 2nd Officer.

27th July 1960. The shaded areas in the sketch show the presence of sand carried



across the region in the WSW'ly airstream at 1200 GMT. Ships in the area are indicated by the black dots. At the ship itself, the weather at 0600 had been cloudless with excellent visibility and a NW wind of force 3. The wind backed at 0745 to SW, force 4–5, and the visibility decreased: at noon it was about 2 n. miles. Later in the afternoon the wind swung back to NW, force 4, and the visibility increased to 5–6 n. miles. The air temp. at noon was 91·7°F and the wet bulb 82·9°. The radar was on the 40-mile range.

Position of ship: 18° 54′N, 39° 30′E.

Note 1. Captain F. J. Wylie, Director of the Radio Advisory Service, comments:

"From information pertaining to the type of radar set in use, and reference to the ship's observation in F.M.21A [*sent to Captain Wylie in full*], there is little doubt that the radar observations recorded were second-trace echoes of high land.

"On a 40-mile range scale and with a pulse repetition frequency of 750 pulses per sec., this radar will receive second-trace echoes between 108 and 148 miles if super-refraction or ducting is present in the atmosphere.

"Confirmation that weather conditions were suitable is suggested by the extremely long range of ship echoes."

Note 2. These sandstorms are probably associated with the Inter-tropical Convergence Zone, which is normally very near the position of this observation in July.

SANDSTORM
Gulf of Aden

m.v. *Cardiganshire*. Captain R. T. Harries. Suez to Aden. Observers, the Master and all officers.

24th September 1960. At 1230 GMT when the vessel was approaching Aden, a sandstorm was seen to be enveloping the Peninsula and the harbour. It was estimated to be about 5 miles wide, 3 miles long and approximately 2000 ft. in thickness. The wind, which had been WNW, force 3, veered to N while the storm lasted and increased to force 9; it returned to its previous direction and force after the squall passed. Visibility, which had been excellent, fell to only 600–800 yd. at the height of the storm, which moved away out over the Gulf of Aden. The sky became cloudless but a sand haze persisted towards the north and low cloud developed there

about sunset. Both before and after the storm the air temp. was 94°F, but in the interval it fell to 84°. The wet bulb was 76° and the sea 89·5°.

Position of ship: off Aden harbour.

Note. This storm was probably associated with the Inter-tropical Convergence Zone, which would be retreating southwards at this time of the year and normally just south of the Gulf of Aden.

Red Sea

s.s. *Nestor*. Captain A. McDonald. Port Sudan to Aden. Observer, Mr. I. Johnston, 3rd Officer.

13th July 1960. At 0645 GMT when the vessel was leaving Port Sudan, the wind was S'ly, force 2, and increasing, while the visibility was decreasing. Half an hour later the wind was S'W, force 6, and a sandstorm—the Haboob—was in progress which reduced visibility to 100 yd. Bulkheads, etc., on the windward side of the vessel were soon coated with sand. The storm began to abate at noon and it finally cleared at 1220. At 1500 visibility fell to 5 miles due to dust haze and these conditions continued until the vessel arrived in Aden on the following day. At 0600 on 13th: air temp. 94·0°F, wet bulb 82·0°, sea 88°.

Position of ship at 1220: 18° 39'N, 39° 37'E.

Note. s.s. *Nestor* was very close to the normal position of the Inter-tropical Convergence Zone. This storm was probably associated with a northerly advance of moist tropical air and a retreat of desert air. The storm would occur well within the tropical air mass.

BALL LIGHTNING

Southwest Approaches

m.v. *Tremorvah*. Captain C. E. Pratt. Quebec to London. Observer, Mr. J. Merriman, 3rd Officer.

2nd August 1960. At 2245 GMT a reddish white glow, bearing SW at an altitude of about 5°, suddenly appeared in the clouds. It quickly grew in size until it became as large as the sun's disc, and then it moved horizontally towards the N, at a rate which was slow compared with normal lightning, the whole display being visible for 3 to 4 sec. The cloud at the time seemed to be $\frac{3}{8}$ C_M6 but darkness made observation difficult. Air temp. 59·4°F, wet bulb 56·0°. Wind light and variable.

Position of ship: 49° 29'N, 8° 31'W.

Note. This is probably an observation of ball lightning, and of interest because little is known of this phenomenon. The meteorological office at London Airport informed us that an examination of their charts revealed little evidence concerning the origin of the display. The ship was in a slack pressure area between a depression west of Denmark and one to the northwest of Finisterre. There had been thundery activity in the general area, notably between the mouth of the Seine and the Isle of Wight, but this had apparently died out by the time of the incident.

UNUSUAL CLOUD COLOURING

Sulu Sea

m.v. *Suffolk*. Captain S. G. Robinson. Adelaide to Shanghai. Observers, the Master and Mr. B. H. Wood, Supplementary 2nd Officer.

6th September 1960. While the ship was making the eastern passage, green tinted clouds were seen over the Pearl Bank (Sulu Archipelago) between 0250 and 0340 GMT. Of the $\frac{2}{8}$ fair weather Cu. present, those clouds over the Zau and adjacent islands appeared to be a medium or dark green. Some were coloured from the base up to about threequarters of the height, while in other cases the colouring did not extend beyond a quarter of the height. Strong sets prevented observation, but it seems that reflection from the shoal water of the bank could have caused the coloration. Air temp. 84°F, sea 86°. Excellent visibility. Wind calm.

Position of ship: 5° 50'N, 119° 50'E.

CLOUD PHOTOGRAPH
Bahamas

m.v. *Karen Reed.* Captain T. Johnsen.

The very fine photograph (consisting of two prints placed edge to edge) reproduced opposite page 128 was taken by Captain C. T. A. Stannard, who was aboard the ship as charterer's representative, at 1100 GMT (just after sunrise) on 28th September 1960, while in the Crooked Island Passage of the West Indies.

In addition to providing a very good example of cirrus (which we believe is C_H3) the picture affords an excellent illustration of the manner in which C_M6 forms, by the spreading out of the top of a large cumulonimbus cloud to become a band of altocumulus.

The typical flat, level, bases of the large Cu. and Cb. clouds low on the horizon are also clearly shown. Air temp. was 80°F and the wind SE, force 2.

ROLL CLOUD
near Rathlin Island

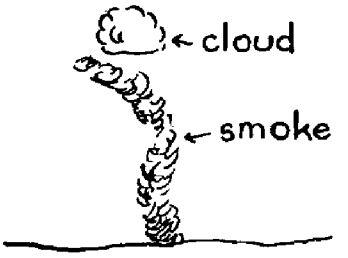
s.s. *Lismoria.* Captain R. McNie. Glasgow to Montreal. Observers, Mr. H. H. Grant, Chief Officer and Cadet A. McCorquodale.

10th September 1960. Roll cloud at an estimated height of about 700 ft. was seen at 0118 GMT, in bright moonlight, extending from horizon to horizon in a line lying 050°–230°; it was moving towards the NE. The only other cloud present was $\frac{1}{8}$ Ci. For an hour after the passage of the roll cloud the sky remained clear. The wind was S'E, force 4, at the time of observation, and it remained S'ly for the next three hours. Air temp. 55·3°F, wet bulb 54·6°, sea 60°.

CUMULUS CLOUD OVER FIRE
East African waters

s.s. *Kenya.* Captain S. A. Richards. Aden to Beira.

27th August 1960. At 0630 GMT when the vessel was about 15 miles off the coast of Portuguese East Africa, a large column of smoke was seen rising vertically from



a fire on the shore. A well-formed Cu. cloud which had formed at the top of the smoke remained stationary for about half an hour while the vessel was in the vicinity. The rest of the sky was entirely free from cloud. Air temp. 77·4°F, wet bulb 72·3°, sea 74·5°. Wind NE, force 4.

Position of ship: 19° 12'S, 36° 12'E.

UNUSUAL CLOUD FORMATION
Greenland coastal waters

s.t. *St. Loman.* Skipper S. Sparkes. Fishing off Greenland. Observers, the Skipper and Wireless Operator K. Massey.

12th September 1960. While fishing at 1100 GMT, the unusual cloud formation shown in the sketches opposite page 129, made by Mr. Massey, was observed over the mountains at Cape Egede. In spite of the fact that a NW'W wind of force 8 was blowing at the time, these clouds, which normally clear away when a wind is blowing

(*Opposite page 128*)

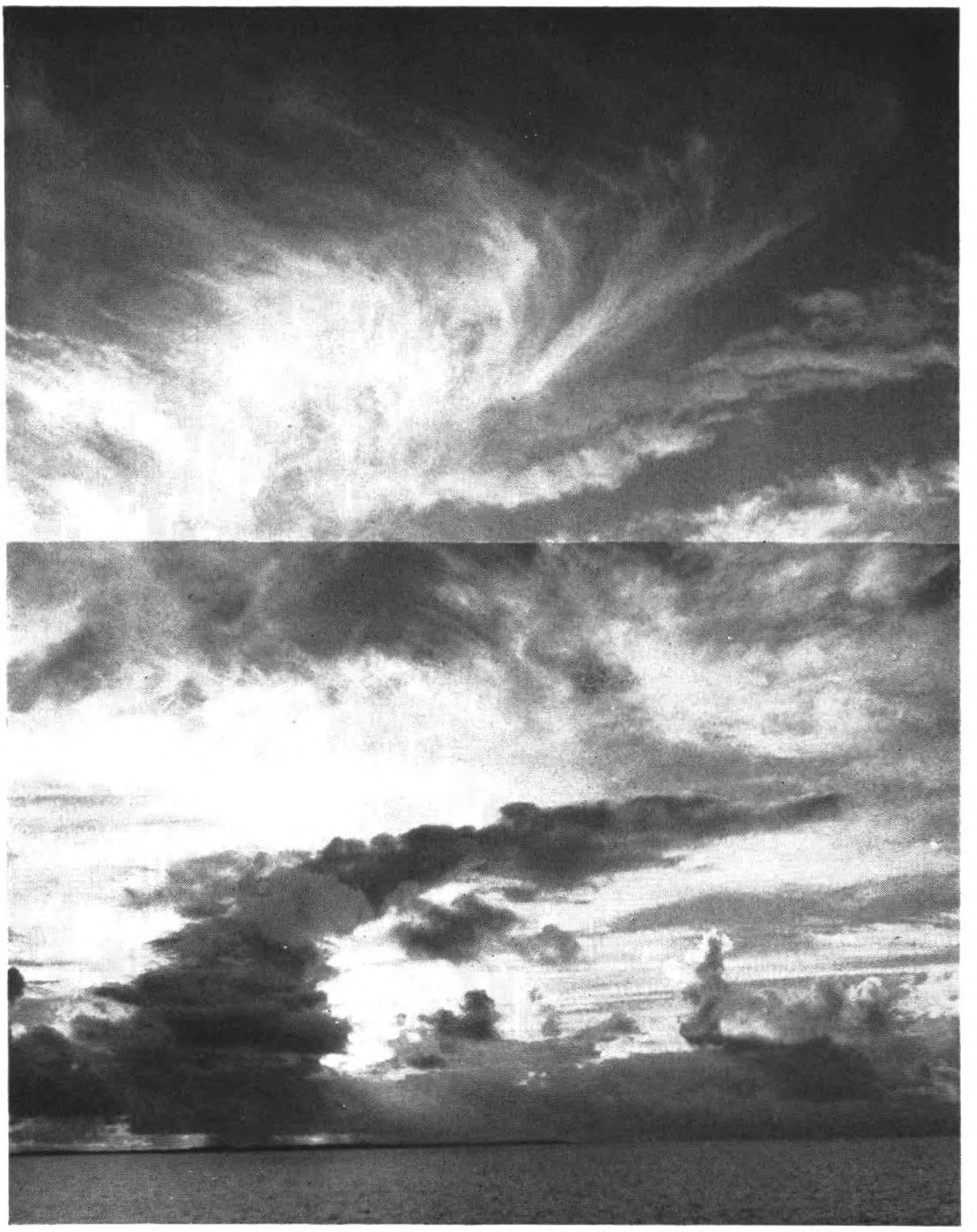
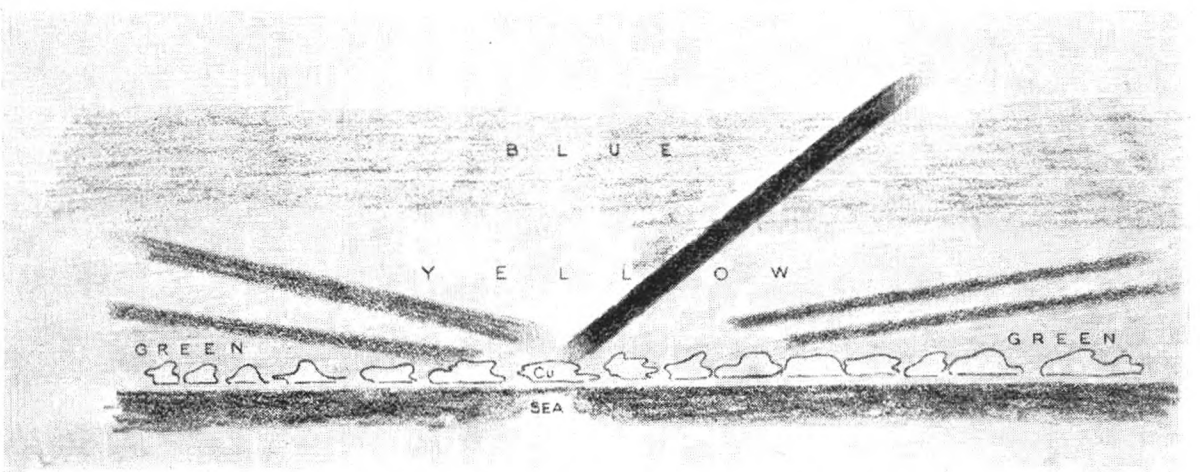


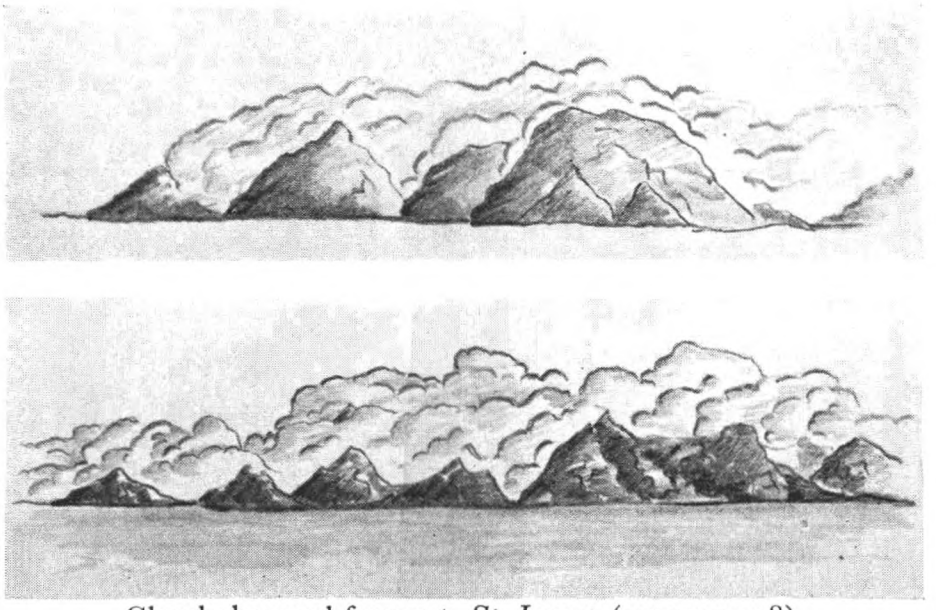
Photo by C. T. A. Stannard

Cloud form observed in Crooked Island Passage, Bahamas (see page 128).

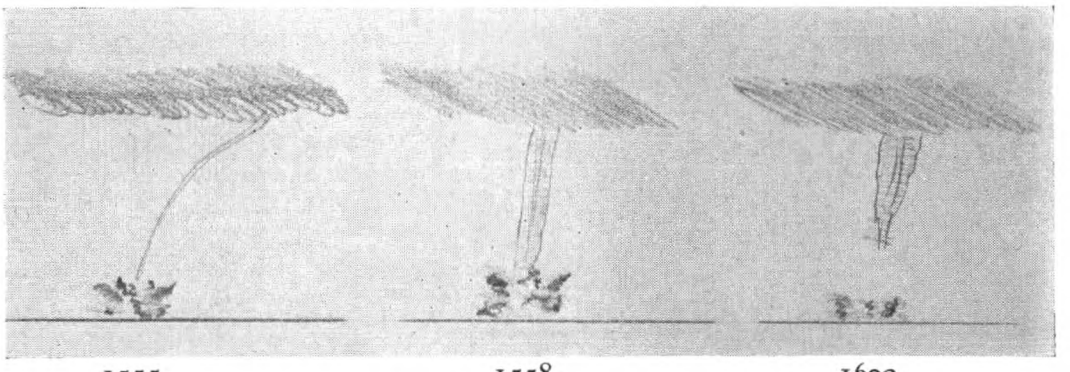


Green rays observed from m.v. *Silverdale* (see page 123).

(*Opposite page 129*)

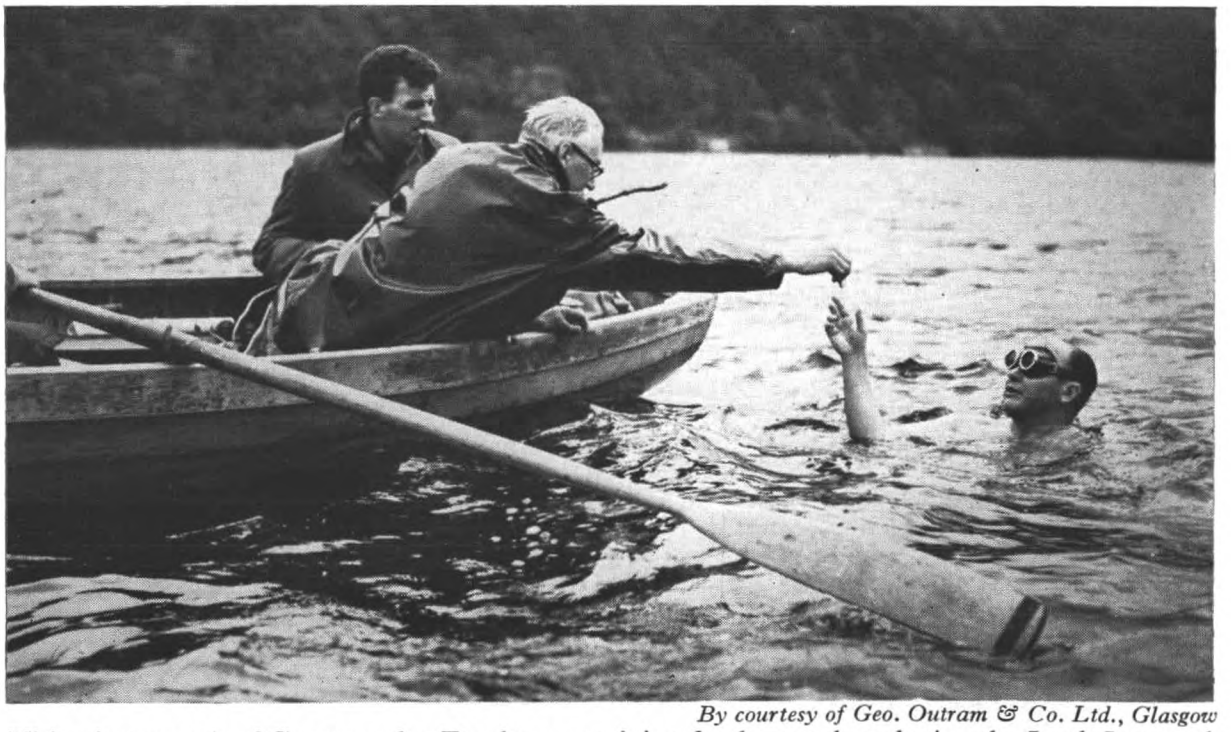


Cloud observed from s.t. *St. Loman* (see page 128).



1555 — 1 mile distant
1558 — ¼ mile distant
1602 — ½ mile distant

Waterspout observed from m.v. *Rangitoto* (see page 129).



By courtesy of Geo. Outram & Co. Ltd., Glasgow

This photograph of Commander Forsberg receiving food was taken during the Loch Lomond Championship of 1958. This operation requires fairly calm conditions, and care; touching the boat or a crew member entails disqualification. (See article on page 130.)

from this direction, remained unaltered and continued to 'droop' all over the mountains. No other cloud was present when the observation was made.

Position of ship: 60° 05′N, 45° 20′W.

Note. This interesting observation occurred when a trough of low pressure, associated with an active depression to the east, ran parallel to the coast of south-east Greenland. The cloud was associated with the interaction of cold northerly Arctic air and warmer and moister Atlantic air. This is typical of areas to the north-west of the Icelandic Low.

WATERSPOUTS

Mediterranean Sea

m.v. *Delphic*. Captain R. Frisby. Falmouth to Port Said. Observers, Mr. I. S. McEwan, Chief Officer, Mr. B. Lloyd, 4th Officer and Cadet P. Smith.

22nd September 1960. Two waterspouts were seen to form about one mile from the ship at 0625 GMT. One of them had a well-defined column and through binoculars this was found to have an anticlockwise rotation. A third spout was observed forming about two cables distance on the starboard bow. It began as a 'catspaw' moving slowly across the surface of the sea and gradually the water became more and more agitated, having the appearance of rising smoke. This process continued until the lower part of a column could be plainly seen developing. Shortly afterwards a moderate rain squall enveloped the ship and the spouts were lost from view. Air temp. 75°F, wet bulb 71·2°, sea 82°. Wind NW, force 2–3. $\frac{5}{8}$ Cb.

Position of ship: 35° 02′N, 19° 21′E.

South Pacific Ocean

m.v. *Rangitoto*. Captain L. W. Fulcher. Wellington to Callao. Observers, the Master, Mr. R. Box, 3rd Officer and Mr. D. Butcher, 4th Officer.

7th August 1960. A waterspout was seen beginning to develop at 1600 SMT about 1 mile ahead of the ship (see sketches on opposite page); it increased very rapidly to maximum size when about $\frac{1}{4}$ mile away from the vessel, which altered course to avoid it. The initial development was a long slender probe reaching down to the sea where it caused considerable surface disturbance.

In the early stages the funnel was about 10 ft. in diameter, but it soon increased to 20 ft. It was some 800 ft. in height and was rotating in an anti-clockwise direction at the rate of one revolution in every 2–4 sec. Air temp. 65°F, sea 67°. Wind NE, force 6. Sea moderate. $\frac{7}{8}$ Ac., $\frac{4}{8}$ Cb. Frequent showers.

Position of ship: 30° 30′S, 104° 18′W.

Coral Sea

m.v. *Trelissick*. Captain G. A. McKay. Kobe to Newcastle, N.S.W. Observers, Mr. A. V. Rowles, Chief Officer and Mr. A. J. Ardley, 3rd Officer.

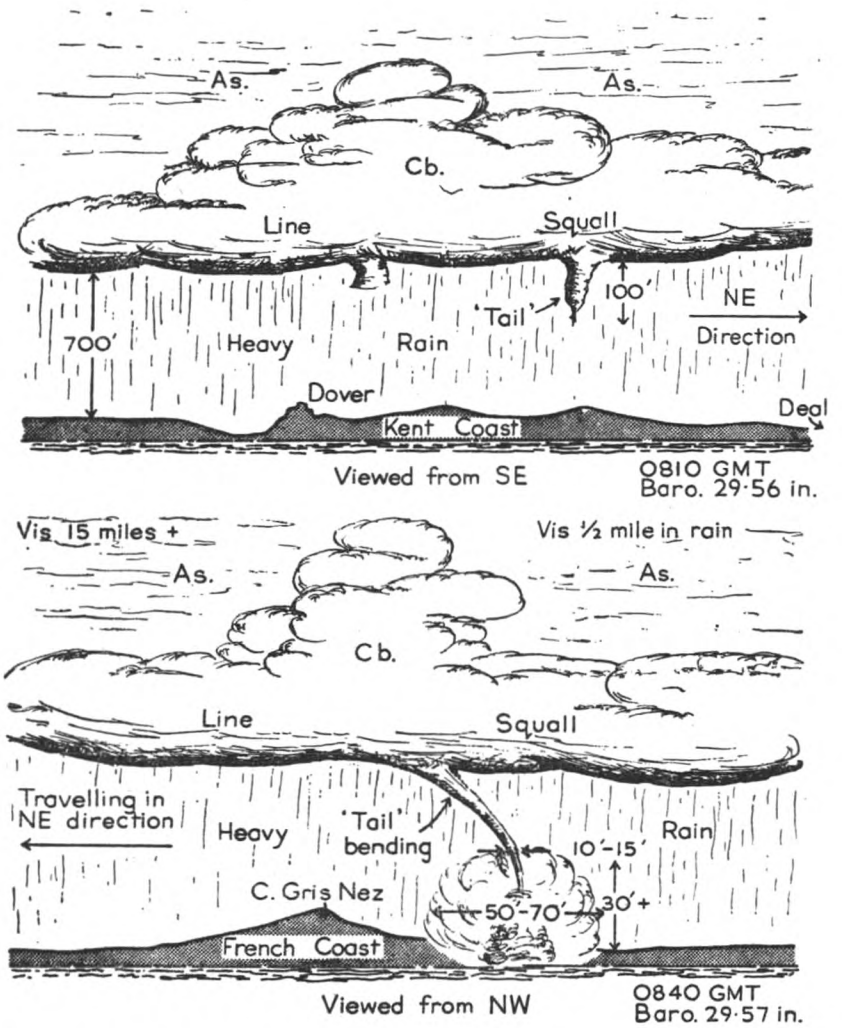
21st September 1960. In the forepart of a rain squall, a waterspout was observed at 1045 SMT moving in a northerly direction; it was visible for 15 min. At its nearest approach, the spout was only about 200 yd. from the ship, and the direction of rotation was clearly seen to be clockwise. The area of disturbed water at the base of the column was estimated at approximately 200 sq. ft.: spray was carried up to a height of 50–60 ft. Air temp. 70°F, wet bulb 63°, sea 70°. Wind SSE, force 4.

Position of ship: 24° 03′S, 155° 40′E.

Straits of Dover

s.s. *Invicta*. Captain W. J. Waters. Boulogne to Dover. Observers, the Master, Mr. M. E. Smith, Chief Officer and Mr. R. E. W. Butcher, 2nd Officer.

4th September 1960. While on passage from Boulogne to Dover, a line squall was seen ahead, after clearing the French port. It was found by radar to be 5 miles ahead of the vessel and lying across its course in a NE–SW direction for a distance of approx.



30 miles. From the base (estimated height 700 ft.) of this otherwise uniform cumulonimbus cloud, a 'tail' was seen at 0810 GMT to be trailing down as shown in the first sketch. After passing under the main body of the squall, which extended for a mile and produced heavy rain, the beginning of a waterspout was observed $1\frac{1}{2}$ miles away on the port beam. This took the form of a disturbance of the sea surface which at first resembled the spray from a garden sprinkler hose, but soon this grew in size and joined up with the protuberance beneath the cloud, forming a column which became bent, since it was travelling more slowly than the parent cloud mass. This phase is shown in the second sketch. The bend became so distorted that it finally broke and the spout collapsed leaving an area of confused water and spray. The last of the waterspout was seen at 0843. Wind NW, force 2. Sea slight.

Position of ship: 50° 55′N, 1° 34′E.

Note. We are glad to have this detailed account of a waterspout with diagrams. The spout was clearly associated with the storm clouds of the line squall. The sequence of events leading to the formation and final break-up of the column are of particular interest. These suggest that two vortices formed—one over the sea, probably set up in unstable air adjacent to the sea, and one in the storm cloud—and that they first joined, and then finally broke apart, due to the motion of the cloud.

Weather Aspects of Channel Swimming

By Commander Gerald Forsberg, o.b.e., r.n.

(Cdr. Forsberg is Deputy Director of Marine Services at the Admiralty, Bath. He has been winner at some time of every major British amateur marathon swim.)

The English Channel is undisputed doyen of all modern marathon swims. It is the universally recognised 'degree' to which swimmers all over the world aspire to graduate. To date, seventy men and twenty-seven women have successfully followed

Captain Webb's 1875 example; they came from twenty-eight different countries. Nowadays, although a crossing in any time remains a notable achievement, record times are primary considerations. Crawl has almost entirely ousted breaststroke. Many other channels around the world have also been swum, amongst them being the Irish Channel, Gibraltar Straits, Bonifacio Straits, Catalina Channel, Juan de Fuca Straits and the Palk Straits. So, although I mostly point my own remarks to the Dover Straits, the study of weather aspects is similar in principle throughout the world, including large inland stretches of water such as Lough Neagh, Loch Lomond, Lake Ontario and the Dead Sea—all of which, as well as others, have been swum.

Before developing the meteorological theme, it is useful to sketch very briefly the overall picture. This gives a clear idea of how weather knowledge completes the complicated jig-saw of consideration. Although almost endless sub-division is possible, it is fair to list only three other main factors in a Channel attempt. Since these are solely for background information, they are stated in the minimum of words and without elaboration.

Here then are those other three main factors:

(1) *Physical fitness.* This includes ability to swim about 600 miles in training, to swim about 25 miles at one stretch, and to withstand cold for long periods.

(2) *Navigational planning.* This consists of long study of navigational charts, tidal charts, tide tables and other hydrographic publications. Study must be followed by meticulously accurate course-plotting and tidal interpolations. And, as swimming speed is a prime essential to accurate calculation, each swim must be computed individually.

(3) *Administrative planning.* This is concerned with arrangement of hotel accommodation, transport, good boats and boatmen, food and stores for the passage, swimmer's requisites, training programmes, and other logistic matters. About £250 is required at present to meet those expenses over the minimum preparatory and operational period. That is for the swimmer alone; the sum is proportionately increased if he is accompanied by advisers or assistants. Bad weather is also a money waster.

Weather study is best commenced by examination of climatic data. Choice of dates for swimming is governed mostly by length of daylight, water temperatures, and air temperatures. In the Dover area, June has longest daylight; August, highest air temperatures; August-September, highest water temperatures. On these facts, the best compromise in that area appears to be mid-August. At that time there are about seventeen hours of daylight, a mean surface water temperature of 61°F, and a mean air temperature of between 69°F (day) and 56°F (night). Two other factors, however, affect selection of dates. First, sea-turbulence is less at neap tide periods than at springs (wind against, and across, the stream causes less disturbances and so does the 'conflicting streams' effect). Second, jelly-fish—whose stings range from painful to dangerous—seem to disappear about mid-August. Resultant from all considerations, the most recommended dates for a Dover swim are during neap tide periods between mid-August and early September. But paradoxically, in warmer climes, water temperature may be the paramount factor. Shark attack is unknown in water at less that 70°F, and swims should therefore be arranged accordingly.

The next useful climatic investigation is into past records of wind forces and directions. Pending the development of really long-range forecasting, a statistical analysis is the best method of predicting what might happen in the current season. And, in the unpredictable English climate, 'might' is the operative word. Nevertheless, if a swim may be done equally conveniently in either of two directions, then going 'with the prevailing weather' improves the chances of success. This is particularly true in lake swimming, which is uncomplicated by tidal streams. In the Dover Strait, by a tidal quirk, it is quicker to swim from France to England than vice versa. But the weather analysis is helpful even in these unequal circumstances.

It is timely to say now that any wind, from any direction, is detrimental to the

swimmer. Swimming efficiency is at its greatest when mirror-calm water permits perfectly rhythmical breathing and maximum forward momentum from each stroke. Wind of course first ruffles and then chops up the water surface. From right ahead its detrimental effect is augmented by the surface wind-drift it induces upon the water. From right aft the detrimental effect of the wind itself on progress is at first slightly overcome by the induced wind-drift. From other angles the degree of disadvantage (or slight advantage) varies according to trigonometrical ratio. But these marginal benefits of wind-drift—even from right aft—are finally defeated by declining propulsive efficiency at about the top of Force 2. That is the position in non-tidal water; in tidal water the effects of 'wind against stream' cause an even earlier retarding effect.

Swims usually have to be abandoned in Force 3–4 from ahead and Force 4–5 from astern. A competent swimmer has naturally not nearly reached the point of being overwhelmed in such moderate conditions, but forward progress is too much reduced for continuance to be profitable. Further, rowing the accompanying boat becomes difficult and its value for instant safety purposes is much reduced. In moderate head winds, swimmers usually make better headway than the boats; this is because of the small freeboard of the human body. The limits given above can be no more than approximate; much depends on the length of swell and its fetch.

Average August wind-speed in Dover Strait is about 15 m.p.h. (13 kt.). This figure is only just short of the maximum acceptable strength. But as that is an average it appears at first that fifty per cent of the time is suitable for swimming. Such is not the case. Suitable weather is required for the whole swim duration, which may be anything between 10½ and 24 hours. (Record is 10 h. 23 min.; longest ever, 26 h. 50 min.) In addition, if a start is to be made from the opposite shore, then two four-hour boat passages must be added to the duration. It may therefore be said that at least a full 24 hours of satisfactory weather is required. Few things cause homicidal tendencies in a marathon swimmer more than to hear—"I thought you would have started. It was such a nice afternoon yesterday."

In my own six years' study, such swimmable periods of 24 hours have occurred on the average only about three times in each August, and in 1956 not at all from 17th July onwards. Indeed, as I started to wait vainly for an opportunity on 29th July, the Channel endured gales with gusts of hurricane force. The Constantine large coaster *Teeswood* broached to and sank off Folkestone; the Southampton University's *Moyana* had to be abandoned further west; the Dover Harbour Board anemometer recorded up to 60 kt. On conclusion of this abortive neap tide period I returned to London on 4th August. Hailstones lay inches deep on the road. Beer froze in a public house cellar in Canterbury. This is fact, not fiction. Even the sea temperature barely dragged itself to the 60 degree mark all summer. In other years, but too rarely, a stationary anticyclone anchors suitable swim-conditions for several days—and once brought the sea temperature to 69°F.

The predominant wind, which is however very indefinite, is westerly. Thus the England-France route appears to be marginally superior by the weather gauge; but being markedly inferior by the tidal aspect, it is therefore not generally recommendable. But the analysis has value. Strong swimmers who do not mind an extra hour or so on passage may still wish to choose the longer route. Those who breathe on the left side may gladly accept that time disadvantage in order that they may take breath on the sheltered side instead of facing into spray and wave-tops for half a day. This is the swimming equivalent to weather routing of ships and aircraft.

So much for long term assistance of climatic study in the planning stages. Later, when the operational stages begin, the weather experts again help—synoptically this time. Meteorological forecasts are the chief—almost only—topic of interest and conversation with waiting aspirants. Personally I use the B.B.C. coastal shipping forecasts as my most trustworthy general guide. With the advent of minute transistor radio sets, they are conveniently available several times daily in even the remotest corners of the United Kingdom. In the event of missing a shipping forecast, quite

useful information can be extracted from the regional land forecasts (despite the fact that those are much concerned with the probability, or non-probability, of rain—hardly a vital issue to a totally immersed swimmer).

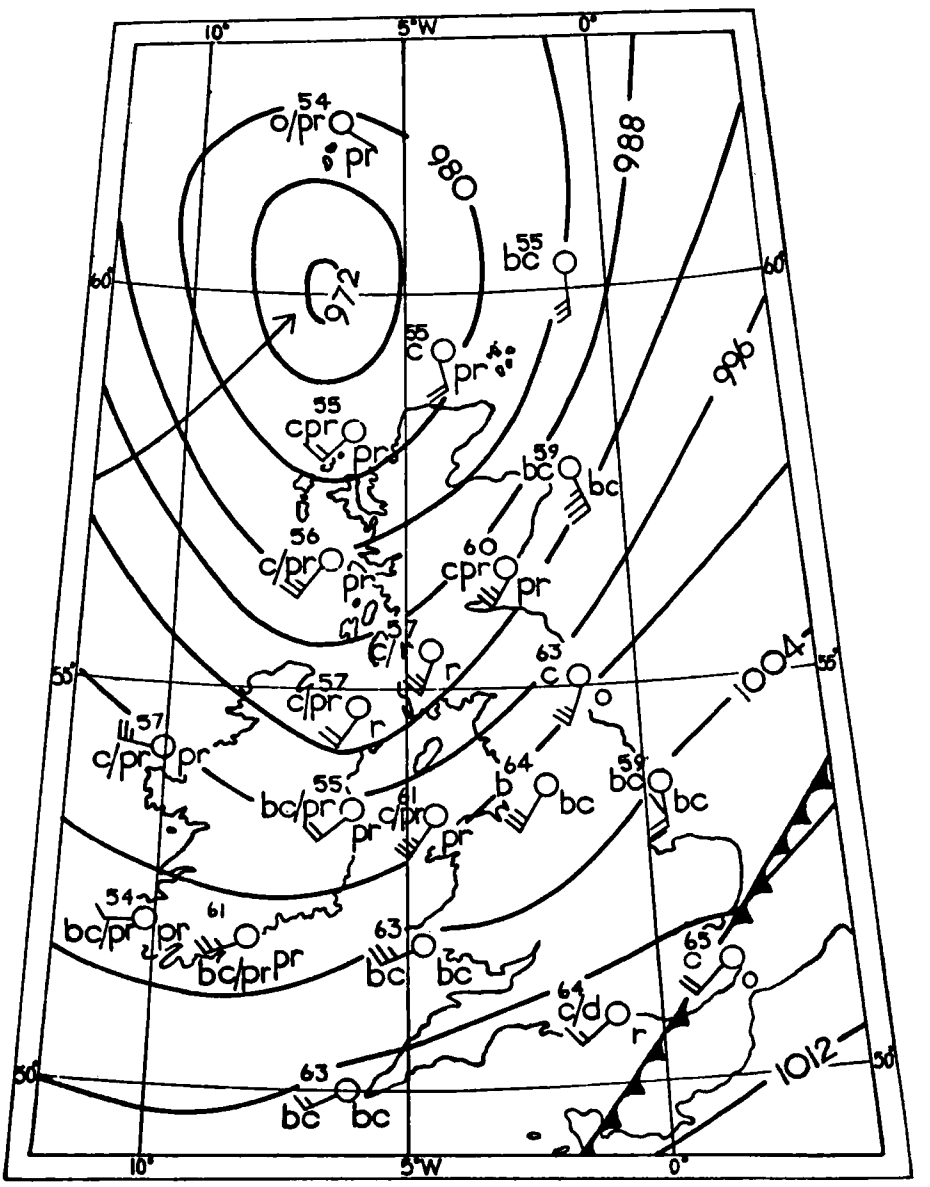
Shipping (and other) forecasts, however, have well-known built-in defects. The data on which they are based must inevitably be slightly stale by the time their resultant forecasts are being transmitted. Further, all sea swims naturally start and finish on a coast line, in which area wind has the best chance of being distorted. Here, bending of winds by funnel-effect, and velocity-changes by differential land-sea heating and cooling, are at their points of maximum influence. For those reasons it is best to use the forecasts chiefly to indicate the *type* of weather prevailing and what *ought* to happen, then to use one's own eyes to see what actually *is* happening. In lakes and enclosed waters katabatic and anabatic effects are almost always present in some degree.

Fortunately, meteorologists are the greatest enthusiasts in the world for their own jobs. I have never yet telephoned any duty officer anywhere, at any hour, without getting a courteous and considered reply. Such advice goes, heavily weighted, into the information kitty, together with the lightly weighted advice of local know-alls and "Red sky at night" brigade. But although all this advice is at the swimmer's disposal, he (or his personal adviser) alone can make the decision to start an attempt. In no normal circumstances would I ever dare to query a professional forecaster's advice. But in this case it is my money which is to be expended on boats, boatmen, official observers, stores, fuel, etc., It is my energy which, if expended abortively, will not replace itself for a week or so. In extreme cases of vicious tidal swims, it might even be my own life at stake. Those are powerful considerations. They make one—for a single, particular, and minute area—temporarily the best forecaster in Britain!

One example of funnel-effect and one of differential-temperature effect are useful as illustrations. These effects are of minor importance to large vessels, of some importance to small vessels, and of infinite importance to swimmers. Last summer I did a minor swim from Kintyre to Arran across Kilbrannan Sound. Wind was southerly (parallel with both coasts), Force 5. But 15 miles away on the Atlantic coast at Machrihanish Airport it was WSW'ly, Force 3—ten knots and seventy degrees difference. At the end of my 1957 Channel swim, the wind on the French coast was sufficient to crest very markedly the tops of waves (say Force 4). But at the Varne in mid-Channel there was a Force 2 wind and calm sea—a ten-knot difference in ten miles. A vessel in Dover also logged Force 4. These factors obviously account for the vociferous opinions of a number of fishermen and longshoremen. More than a few are inclined to say "the Met. Office forecasts never work out in this area". Such opinions may result from lack of thought or memory. Or they may be due to a resentful nostalgia for the days when old salts were the only weather pundits.

There is one other particularly important weather aspect. That is fog. Unfortunately, this almost always occurs on days which are otherwise quite perfect for swimming. But it is distinctly eerie to have an unseen South Goodwin diaphone almost blasting one out of the water twice a minute. And somewhat daunting to hear anchor bells ringing and stentorian syrens passing within a cable. There is—one supposes—no more chance of being run over here than in Piccadilly. But the 'noises off' are more impressive. After 25 years on the bridges of numerous ships, I am perhaps over-sensitive on this matter. Non-nautical swimmers set off happily while I am still cautiously checking the rigging of the radar reflector which is a permanent item of my kit! Besides the psychological disadvantages of fog it also means navigating blindly. Few boats have any form of electronic navigation. For this reason alone, prospective record breakers might as well not start in poor visibility.

To sum up, I advise enquirers not to start any Channel-size tidal swim unless the forecast for the following 24 hours is settled, and promises winds of not more than Force 3. A swim should be discontinued if Force 5 is encountered en route. That is, unless the skipper of the accompanying boat is confident that it is only a temporary



Weather chart for 1200 GMT on 7th September 1957

condition, or if the swimmer is within an hour or so of finishing. In enclosed stretches of water greater wind strengths can be accepted from certain directions. (On 7th September 1957, I swum 10¼ mile Lake Windermere in a Force 7 quarterly wind. See weather chart above.) I also advise swimmers—especially record-breakers—not to swim when there is less than three miles visibility. Particular safety vigilance is necessary in inshore breakers or severe overfalls.

Every seaman who has handled a small boat in a seaway, and every seaman who has handled his ship through fog, will appreciate the above to be sound advice. Swimmers will also know it as sound advice—for everyone else but themselves. Swimmers who can be persuaded to come out in the middle of a swim are in a minority. And forcibly dragging a reluctant, greasy, fifteen-stone plus, strong man out of the water is almost a superhuman task.

This article is self-evidently a practical seaman's study of one of the seamanlike aspects of open-water swimming. I am more at home with Buys Ballot's Law than with symbols, equations and upper-atmospheric meteorology. So if any reader can academically contribute further to knowledge of the subject, I shall be grateful, and particularly for one piece of information—when swimming in a thunderstorm

with lightning erupting all round, is it reasonable to feel apprehensive about electrocution?*

Any knowledge obtained will be passed on for the benefit of the swimming fraternity. At age 49, I have finished hoarding knowledge. As Meredith says—

> "We spend our lives learning pilotage,
> And grow good steersmen when the vessel's crank."

Professional colleagues have argued lengthily about whether I was legally a vessel.† But never about the quotation's terminal adjective.

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Ships' Reports and the Pilot

By B. F. BULMER, B.A.

(Mr. Bulmer is in the Climatological Division of the Meteorological Office, and is responsible for revising the meteorological section in all 74 Admiralty Pilots.)

> "These men see the works of the Lord, and his wonders in the deep."
> Psalm 107, verse 24.

Marine observers will naturally be interested in what happens to their observations. Those concerning the weather are put to a variety of uses, many of which directly or indirectly return to benefit the observer. Apart from observations of phenomena which are of interest in themselves, the more routine observations of the ordinary weather variables such as, for example, wind, serve two main purposes.

Firstly they serve, in conjunction with observations from other vessels, and from the land, to determine the weather processes occurring at the time of the observation. In other words, they determine the 'synoptic picture' and form the basis for a forecast of the immediate future.

Secondly they provide statistics which, when collected over a protracted period, define the average conditions and the range of variation from the mean for a given ocean area. From such statistics, marine climatic atlases can be prepared, which give in a convenient form the normal values and frequency distribution of various elements, such as wind, fog, gales, etc., in different regions and seasons.

Thus, a ship's observation, taken in conjunction with others, will normally serve both the short-term purpose (for example, to indicate the presence and movement of today's depression, and possibly to cause gale warnings to be issued for a certain area) and the long-term purpose (to determine, for example, the prevailing wind and its degree of constancy, in a certain latitude and longitude, in a given month).

In both these cases the observation, as it were, comes back to roost, in the sense that it enables the ship to be given a warning on a particular occasion, and helps

* We are advised that it is reasonable to feel apprehensive whilst swimming in a thunderstorm, but no more so than when walking on land. There is a slightly less risk of being struck while swimming in the sea, but it is nevertheless unwise.

The swimmer would be less safe if he were to board an accompanying rowing-boat, but in a cabin cruiser, particularly if the cabin shelter were of metal, he would be very secure. —*Editor.*

† The answer to the query as to whether a swimmer is a vessel or not appears to be 'no', because a swimmer is not being used for navigation. (See also dictionary definitions of 'vessel', 'ship' and 'boat'.)—*Editor.*

to provide the climatic charts, wind roses, etc., among the ship's papers which may be useful in navigation and planning.

Such climatological data in a condensed form is presented in the 'Pilots' or Admiralty Sailing Directions which constitute another channel by which the mariner's observations are fed back to him. It has been suggested that observers might be interested to know how the meteorological information in the Pilots is obtained.

There are some 74 volumes of Sailing Directions, each covering a defined ocean area and coast line, and together covering the globe. These are subject to a major revision at intervals of about twelve years, while minor amendments are published more frequently. Periodically, a note comes from the Admiralty Hydrographic Office, via the Naval Weather Service, to the Meteorological Office, intimating that a particular Pilot is to be revised, and asking the Meteorological Office to attend to the meteorological portions. A date is agreed and work starts.

The work involved varies considerably from volume to volume. The *Channel Pilot*, Volume I, describing the south coast of England, naturally presents a very different problem from that entitled *The Antarctic*, which covers the oceans and all coasts south of about latitude 55°s. In the former case the region is well known and much frequented and there will probably be little to add to what has already been said. In the latter case, most of the vast area is unexplored and relatively little known about it. However, much more information has come to light in the last twelve years. So in this case there is both a much weaker foundation and a lot more building to be done than in the case of a familiar area like the English Channel. Most of the Pilots occupy an intermediate position between these two extremes. *South America Pilot*, Volume I, for example, which covers all the coast of Brazil, Uruguay and Argentina down to the Magellan Strait, is moderately well known and described.

Naturally, anyone engaged on the revision of Pilots cannot be expected to have first-hand experience of all the multitudinous coast lines of the globe, and has to rely chiefly on published data and descriptions. In the case of a moderately familiar area, such as the east coast of South America, the two main aims of the revision are, firstly, to study all available literature on the area with a view to checking the soundness of the facts given in the existing Pilot, and secondly, to study all material published since the last revision, with a view to incorporating any new facts or information.

As the Pilot is primarily interested in the weather of the coastal belt, it is necessary to study both the weather conditions over the land adjoining the coast, with special emphasis on coastal stations, and the conditions over the sea.

Climatological data for the inland and coastal stations are primarily obtained from publications of the country concerned, for example, Brazil, while over the adjacent sea the observations of mariners over many years have been used to compile the marine atlases which provide the basic data for the oceans. Ships' observations collected by the Marine Division of the Meteorological Office form the basis of the Monthly Meteorological Charts of the various oceans which are the prime source of marine climatology used in revising the Pilots. Other maritime nations, notably the U.S.A., also compile marine climatic atlases and these are also consulted.

When commencing the revision of a Pilot, recourse is first made to the climatological bibliography of the Meteorological Office Library. From this a note is made of all publications containing relevant climatological statistics issued since the date of the last revision. A further note is made of all major works before this. Usually it is not necessary to go back much further than about 1930, but in some parts the basic reference works may be appreciably earlier.

Then commences a detailed study of all this material. In general, much of it will be in a foreign language. Sometimes translations are available, but often not, so that familiarity with foreign languages is very desirable. Much of the literature

will have little bearing on coastal climatology, and a lot of irrelevant material has to be combed to find a few relevant facts. Works on the climatology of whole countries have to be searched for the few references to coastal conditions. Different authorities' descriptions do not always tally, and judgement has to be exercised to decide which version can be accepted.

Following the descriptive material in the Pilot are the climatic tables for the various coastal stations concerned. These tables in themselves constitute an objective statement of the climatology of selected places in the region. They are re-computed for each revision, the aim being to produce statistics covering a period extending back about thirty years from the time of the revision.

Given a well-known region, with adequate data available, it might perhaps be thought that, once the climate had been fully described, there would be little need to revise the data. The fact is, however, that climate is not necessarily static, and the conditions obtaining in a region, say, from 1900 to 1930 are not necessarily repeated in a period such as 1930 to 1960.

Most countries publish continuous climatological records for their more important stations in the form of monthly weather summaries, or year books, and these provide the data necessary for computing up-to-date climatological tables. As soon as the *Norway Pilot*, Volume II, for example, is due for revision, tables for places like Bergen are calculated from the *Norsk Arbok* (*Norwegian Year Book*). Tables for Vestmannaeyjar, in Iceland (*Arctic Pilot*, Volume II), are computed from the *Manadaryfirlit Samid á Vedurstofunni* (*Iceland Monthly Weather Review*) and those for Lisbon (*West Coasts Spain and Portugal Pilot*) from the *Anuario Climatologico de Portugal* (*Portuguese Year Book*).

Normally, all the necessary statistics for these foreign or overseas stations are available in the Meteorological Office Library. But occasionally no recent data are available, as for example, in the case of a Latin American state where there has been a revolution. The last World War caused a gap in the records of a number of countries. Under these conditions it is sometimes preferable to continue to publish means and extremes based on a long, uninterrupted period of years, which are not so recent, rather than to accept up-to-date figures for a shorter period of years. In general, the degree of variation due to climatic change over periods of the order of fifty years is small compared with the random variation found in successive short periods.

Apart from the two main branches of climatology, namely the broad-scale marine climatology and the rather more detailed land data, which are brought together in the Pilot, the latter presents a unique collection of specialised local knowledge of weather peculiarities over the coastal waters. Typical are such statements as ". . . This passage (Canal Boqueirão, near Cabo Frio, Brazil) should never be attempted during fresh south-westerly winds, which raise a heavy cross sea." . . . or ". . . In Hvalfjord (Iceland), at about 1700 local time, after a fine day, northerly winds come down the slopes and valleys and, striking the water along the northern shore, raise a considerable sea, which rises rapidly and renders boat work hazardous."

Such local detail is not normally available from any source but the Pilot, and derives mainly from the steady accumulation, through the years, of mariners' observations. In some cases the original source of such detail may be records from expeditions, or in some cases may have been furnished by local harbour masters, but it is ships' meteorological logbooks which provide the continuous source of fresh information and the check on existing knowledge. Reports such as those published in the 'Marine Observers' Log' are carefully combed for significant local peculiarities with a view to incorporating them in a later edition of the Pilot. A typical example is the report by m.v. *Lingula* of a local wind, published on page 62 of the April 1961 number of this journal.

Naturally, the report of a strong wind off Cape 'So-and-so' may not, in itself, be climatologically important, but if there is good reason for thinking that the

general winds in the area were less strong, the report becomes interesting. If then further reports come in suggesting local intensification of wind off the said cape, it becomes, in time, to be an accepted fact, and finds its way into the Pilot.

Since it is impossible to visit all the regions described, the next best thing, after studying the relevant literature, is to discuss local phenomena with those having first-hand experience and, whenever possible, personal contact is made with the masters or officers of vessels plying to ports in the area concerned. Visits to the docks for this purpose can resolve difficulties posed by conflicting reports and can fill gaps in the existing knowledge.

"FACSIMILE"

It is obvious that, in order to get an instantaneous picture of the weather over a large area of the world, a weather map has to be used—a synoptic map. Photographs from satellites can, it is true, provide a picture of cloud conditions from aloft, from which quite a lot of useful information about existence and movement of weather systems can be deduced, but such pictures cannot give the detailed story of the various elements between the clouds and the earth's surface that the meteorologist needs.

Crude synoptic maps were used by meteorologists ashore as long ago as 1855, using telegraphed data from land stations. It was not until radio came on the scene in 1912 that synoptic weather maps were able to include data transmitted from ships at sea. This virtually saw the beginning of the Selected Ship scheme.

It was soon realised that although the weather map was essential to the meteorologist, it was also of considerable value to those who make operational use of weather information—seamen and aviators. One does not need to be a meteorologist to understand the meaning of the contours and other information shown on a weather map, and the effect of television has been to educate the general public to understand quite a lot about what these maps show. The value of a weather map from the operational viewpoint is that with its aid one is better able to understand the reasoning behind the bulletin and forecast that is issued. This is particularly important at sea, where the mariner cannot consult a qualified weather forecaster. The aviator, however, has the advantage of being personally briefed by the forecaster with the aid of the weather map.

The aviator, before he takes off on his flight, is supplied with a copy of the current weather map and other meteorological information by the forecaster. A seaman, on the other hand, has to prepare his own weather map, from information received by radio. The drawing of simple weather maps has for many years formed part of the Examination for Masters and Mates in the United Kingdom, and consequently practically all deck officers serving in British ships are familiar with the necessary procedure. Prior to 1948, the drawing of weather maps at sea was rather a laborious business and was based upon station reports from shore and reports intercepted from other ships at sea. As a result of a recommendation of the Commission for Maritime Meteorology at Toronto in 1947, it was agreed on an international basis that Meteorological Services would include, in radio weather bulletins for various ocean areas, information whereby the drawing of weather maps by the seaman was very much facilitated. The analysis included in the North Atlantic Weather Bulletin is an example of such a message, and it seems that this, in association with the contents of the written bulletin and forecast, does enable the ship's officer to have a very good appreciation of the weather conditions that he is likely to experience during his voyage. Aboard many ships nowadays the drawing of weather maps by the ships' officers has become a matter of routine and it seems that a considerable amount of operational value is derived therefrom. It is laid down in the technical regulations of the World Meteorological Organisation that weather bulletins for shipping on the high seas shall include storm warnings, a synopsis of meteorological conditions in the forecast area, forecasts, and (as

optional items) an analysis and a selection of ship and land station reports. The International Convention for the Safety of Life at Sea (1948) says that contracting Governments should include in their weather bulletins for shipping "when practicable, sufficient additional information to enable simple weather charts to be prepared at sea".

During recent years the Meteorological Services of the world have made increasing use of the technique known as 'facsimile' for broadcasting weather information, whereby a complete picture of a weather map is transmitted by radio or landline, in a similar manner to that in which photographs are transmitted by radio. There are several systems of sending and receiving charts by facsimile. The system used by the British Meteorological Office is described below.

The chart to be broadcast is placed on the drum of a transmitter (see photograph opposite page 112) and it is scanned by a unit which throws a spot of light on the chart and picks up the reflection of the 'blacks' and 'whites' on a photoelectric cell. The drum is rotated at a constant speed of one or two revolutions per second whilst the scanning unit slowly moves along a track parallel to the axis of the drum. Thus, the chart will be scanned in the form of a spiral. The variations between black and white on the chart will cause electrical impulses in the scanning unit which can be transmitted by radio or landline. When these impulses are intercepted by a radio receiver or are sent on a landline, they are fed into a recorder which is set to work in phase with the transmitter. In the recorder (see photograph opposite page 112) the impulses are made to vary the current which passes through a special electro-sensitive chemically treated paper moving at constant speed between a fixed steel 'writing blade' and a rotating helix. The chemical action which takes place on the paper at the point of contact of the blade and the helix causes a mark which corresponds to one on the chart being transmitted. The density of the mark depends on the radio or landline signals being received. The movement of the recording paper and the rotation of the helix cause the point of contact to cover the paper in a series of horizontal traverses and in this way a chart is built up. Experience has shown that such maps are very clear and easy to read, and the procedure has the advantage of saving an enormous amount of time and labour at various meteorological centres. Prior to the use of facsimile, staff at every meteorological office had to plot their own weather maps in detail, as received by radio or teleprinter.

Facsimile transmission offers some attractive possibilities insofar as shipping is concerned. The schedule of radio facsimile transmission indicates that weather maps of various types and scales are transmitted daily at frequent intervals from Canada, France, Japan, Norway, Sweden, United Kingdom, U.S.A. and Western Germany. So far no facsimile broadcasts for meteorological purposes are issued in the southern hemisphere. Frequencies used are such that if a ship were fitted with a suitable facsimile receiver, the 'pictures' could be received through the medium of the normal ship's radio apparatus. In the Eastern Atlantic, there seems no doubt that facsimile transmissions issued from European countries would be readily received aboard a merchant ship as far as 40°W. Similarly, transmissions from U.S.A. and Canada would be receivable at the same longitude.

The information shown in certain of the facsimile maps which are issued at present, although primarily intended for general meteorological purposes, would be quite suitable for use by ships' officers. For example, the sea level analysis issued from Dunstable at 0300, 0900, 1500 and 2100 GMT, and the sea level prognosis (forecast) charts which are valid for 24 hours and issued at 0000, 0600, 1200 and 1800 GMT, although they extend over a considerably larger area than the Atlantic, would provide the mariner with an up-to-date picture of the existing and anticipated weather situation in the area. The speed of transmission of these facsimile maps is such that it would take about twenty minutes for a complete weather map to be received aboard the ship.

In addition to weather maps, certain countries, notably Canada and the U.S.A.,

issue ice maps by facsimile. Anybody familiar with floating ice knows how difficult it is to convey a true picture of ice conditions in words and how laborious is the task of receiving a descriptive report of ice conditions and then plotting it manually on a chart. With the aid of facsimile a complete picture of the ice situation can be presented to the mariner in a few minutes.

The International Convention for Safety of Life at Sea (1960), which has not yet become law, but which will eventually replace the 1948 Convention, requires contracting governments to "encourage the transmission of suitable facsimile weather charts" and "to arrange, if practicable, for the publication and making available of daily weather charts for the information of departing ships". These two requirements are, to some extent, interrelated. Supply of the maps to ships leaving port is already in force in certain European ports—e.g. London, Hamburg and Rotterdam. But it is fairly obvious that in large ports such as these the issue of weather maps to every ship leaving that port is a complicated job and by the time the maps reach the ship they are, in many cases, rather out of date. In London, for example, weather maps completed at 0800 GMT, based upon midnight observations, have to be sent by messenger from the London Forecast Office to Charing Cross Station, thence by train to Gravesend where they are sent by hand to the Pilot Station so that each pilot can deliver one to the master as he boards an outward-bound ship. If ships were fitted with facsimile recorders, they would be able to receive similar information more up to date, and at more frequent intervals. The transmission frequency at present in use in the United Kingdom is such that it might be difficult at times for ships in the London Docks to receive these transmissions. Such ships would, however, be able to receive transmissions from continental transmitters at Paris and Offenbach, provided that they were equipped for the reception of low frequencies (Dunstable uses high frequencies).

Up to the present, there are not many ships afloat fitted with facsimile recorders. It is known that a few German, Danish, and American merchant ships are fitted with such recorders, largely on an experimental basis. And quite a few naval ships are so fitted. It is believed that no British merchant ship has been fitted with a facsimile recorder up to the present.

During 1958 some trials with facsimile apparatus were carried out aboard the British weather ship, *Weather Recorder*, while on duty at Ocean Stations 'J' (52° 30'N, 20°W), 'I' (59°N, 19°W) and 'A' (62°N, 33°W). A report from the master showed there was satisfactory reception from Dunstable, Washington and Stockholm, at 'I' and 'J', but that only Dunstable transmissions were of much value at 'A'.

The type of recorder used by the British Meteorological Office, which seems to be suitable for use aboard ship, is about 28½ in. wide, 22¾ in. high and 12¼ in. deep and it takes a roll of special paper, 18 in. wide by 100 ft. long. It appears that it could be connected to any high quality radio communication receiver.

C. E. N. F.

551.326.7

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JANUARY TO MARCH 1961

At end of January 1961

RELEVANT WEATHER FACTORS

The distribution of pressure was unusual and variable during January 1961. It was towards the end of the month only, that the Icelandic low pressure area predominated in the North Atlantic Ocean.

The two outstanding features were very low temperatures over North Western Canada and adjacent sea areas, and high temperatures over southern Greenland and sea areas between Greenland and Europe. There were frequent north to north-west winds over Baffin Bay and the Davis Strait which tended to strengthen the Labrador current. Winds off eastern Greenland were sufficiently strong to greatly strengthen the East Greenland current south of 70°N.

There was no evidence, however, that this current was stronger than usual to the north of 70°N.

Baffin Bay, Davis Strait and the Canadian Arctic Archipelago

Very little information was received from this area but temperatures below normal during January suggest that there were large areas of heavy pack-ice in Baffin Bay. In addition, reports of considerable areas of pack-ice and a number of icebergs off Labrador indicate that there were large amounts of all types of ice moving southwards on the western side of Davis Strait. Small numbers of icebergs were reported moving northwards off south-west Greenland while moderate or large numbers were reported off western Greenland north of the Arctic Circle. There were no reports of pack-ice off south-west Greenland south of the Arctic Circle.

Gulf of St. Lawrence, St. Lawrence River and Great Bank

By the end of January the St. Lawrence River and Estuary and the Gulf of St. Lawrence were full of moderate or heavy pack-ice with very large floes in parts of the Gulf. Much of this ice was moving through the Cabot Strait. Conditions were more severe than usual but one ship got through to Quebec with ice-breaker assistance on 20th January.

Pack-ice and icebergs were moving south in considerable quantities off eastern Newfoundland but no icebergs or pack-ice were observed over the Great Bank.

Eastern Greenland, Spitzbergen, Bear Island and Areas North of Iceland

South of 70°N, all types of field-ice were below normal. North of this the distribution of field-ice was approximately normal, but the area of more open pack-ice was probably greater than normal towards Spitzbergen and Bear Island. Sea areas around and north of Iceland remained completely free of ice.

Large numbers of icebergs were observed moving southwards off south-east Greenland. More than 200 were observed from some land stations.

Baltic Sea

Except in the north of the Gulf of Bothnia, where ice conditions were approximately normal, most of the Baltic experienced temperatures above average and the mass of ice formed was considerably below normal.

Towards the middle of the month Polish and German ports and inland waterways were obstructed by ice during a cold anticyclonic spell.

An analysis of ice conditions in the Baltic Sea for the months January to March is given in Table 2.

At end of February 1961

Relevant Weather Factors

Pressure was above normal over north-east Canada during most of February, while the Icelandic low and its north-eastern extension north of Scandinavia were more intense than normal. An abnormally strong surface current of Arctic air flowed from the north over the sea areas between Canada and Greenland, impinging on to the coasts of Labrador and Newfoundland but tending to flow off western Greenland. The atmospheric circulation tended to increase the strength of the Labrador Current and the East Greenland Current south of 70°N, and caused much air from more southerly latitudes to flow towards the Barents Sea.

Baffin Bay, Davis Strait and the Canadian Archipelago

Very little information was received from this area. Meteorological conditions suggest that the mass of ice (i.e. area and thickness) was above normal, and so any break-up would be late in the season. In addition, pack-ice was probably consolidated and pressurised all along the Labrador and East Newfoundland coasts. Very severe ice conditions were reported locally along these coasts.

Small numbers of icebergs (less than five from each land station) were reported off south-west Greenland, but large numbers were reported towards 70°N (at times more than 100 were sighted). The flow of icebergs off Labrador appears to have been above average, judging from iceberg reports from further south.

Great Bank

The mass of pack-ice moving south on to the Great Bank was above normal; it was consolidated and pressurised towards the Newfoundland coast. The harbour of St. John's, Newfoundland, was obstructed and at times blocked by heavy pack-ice. The number of icebergs observed moving southwards towards the Great Bank was above average; they moved mainly along a track around the north-east limits of the Bank. This contrasts with the end of February 1960, when no icebergs were observed south of 58°N.

An analysis of iceberg reports for the months January to March 1961 is given in Table 1.

Gulf of St. Lawrence, St. Lawrence River and Estuary

This is a year of very severe ice conditions in the Gulf of St. Lawrence and in the River and Estuary. Many ships have had great difficulty in making their way to Quebec. At the end of February the whole of the Gulf, the approaches to Quebec, Chaleur Bay and sea areas round Prince Edward Island, were full of pack-ice in varying states including many large floes of heavy pack-ice. Pack-ice moved very extensively through Cabot Strait and southwards to sea areas off the east coast of Nova Scotia.

East Greenland Coast North of 70°N

The area of fast and continuous ice extended out from the coast to beyond 15°W north of 73°N, and areas of open pack were in excess of normal. Moderate numbers of icebergs were observed to be moving southwards. (The number observed from each land station was less than 50.)

East Greenland Coast South of 70°N

Considerable areas of pack-ice, at times very open, were observed east and south of Scoresby Sound, but south of the Arctic Circle the area of pack-ice remained below normal. The numbers of icebergs moving southwards observed from coastal stations were variable, but were mainly small to the south (less than ten reported from each land station) and moderate or large to the north (occasionally, land stations reported more than 50).

Spitzbergen, Bear Island and Areas North of Iceland

Pack-ice was reported on the west coast of Spitzbergen and at Bear Island, but in general the prevailing weather conditions suggest that towards the end of February areas of pack-ice must have been lower than normal in most of the Barents Sea. However, in the extreme north-east and east there probably existed considerable areas of heavy pack-ice.

Baltic Sea

At the end of February the area and thickness of ice were well below normal and most of the important Baltic ports, including Swedish and Finnish ports, were clear of ice. Dangerous ice remained in the north and east of the Gulf of Bothnia and in the east of the Gulf of Finland. Considerable amounts of fast-ice generally remained in inlets and between islands north of 58°N.

At end of March 1961

Relevant Weather Factors

During March the Icelandic low gave way from the south and pressure built up over the Polar Basin. Arctic air flowed south and south-eastwards over the sea area off eastern Greenland and tended to strengthen the East Greenland current. The gradient wind became more

Table 1. Icebergs sighted by merchant ships in the North Atlantic

(This does not include radar targets)

Limits of Latitude and Longitude		Degrees North and West								
		56	54	52	50	48	46	44	42	40
Number of bergs reported south of limit	JANUARY	*	3	0	0	0	0	0	0	0
	FEBRUARY	*	*	*	35	18	0	0	0	0
	MARCH	*	*	*	110	84	7	0	0	0
	Total	*	*	*	145	102	7	0	0	0
Number of bergs reported east of limit	JANUARY	*	3	0	0	0	0	0	0	0
	FEBRUARY	*	*	29	10	1	0	0	0	0
	MARCH	*	*	77	22	3	1	1	1	0
	Total	*	*	106	32	4	1	1	1	0
Extreme southern limit	JANUARY	No extreme position available								
	FEBRUARY	46° 02′N, 51° 38′W on 28.2.61								
	MARCH	45° 41′N, 49° 49′W on 13.3.61								
Extreme eastern limit	JANUARY	No extreme position available								
	FEBRUARY	46° 12′N, 47° 35′W on 25.2.61								
	MARCH	47° 31′N, 40° 48′W on 20.3.61								

* Probably larger numbers, but none sighted in excess of those reported in further south positions or in further east positions.

Table 2. Summary of ice conditions reported from a selection of places in the Baltic Sea

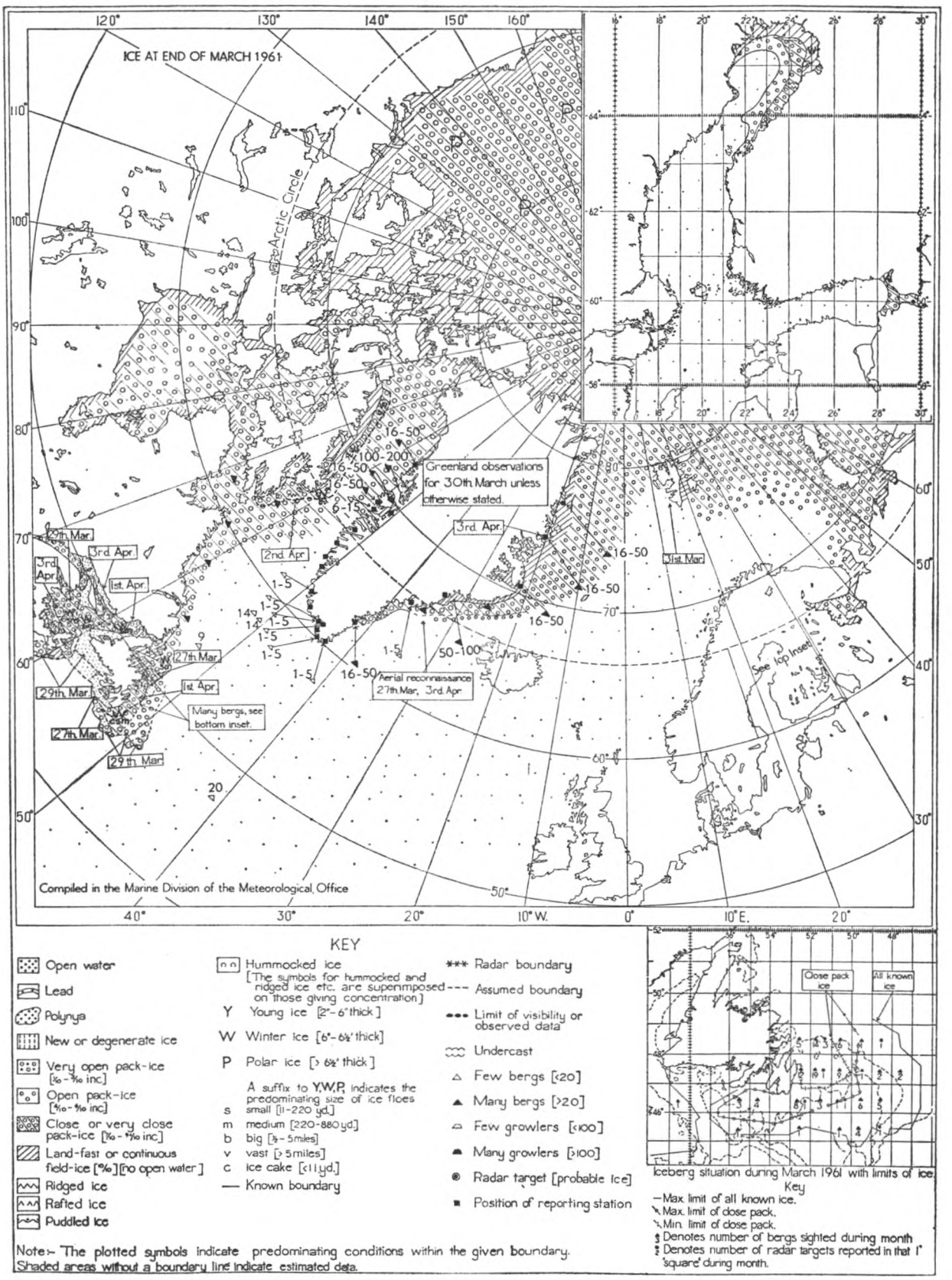
	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree-days	
	A	B	C	D	E	F	G	H	I	
JANUARY 1961										
Lulea	1	31	31	31	0	0	0	31	888	NO ICE HAS BEEN REPORTED SO FAR THIS SEASON AT THE FOLLOWING STATIONS: Aarhus, Copenhagen, Stettin, Dansk, Visby, Goteborg, Oslo (Rauoy-fjord), Kristiansand
Skelleftea	1	31	31	31	0	0	9	22	—	
Bredskar (Umea)	1	31	31	7	5	21	5	0	—	
Alnosund	1	31	31	10	0	31	0	0	416	
Sandarne	9	31	23	18	0	2	17	0	—	
Stockholm	9	31	23	10	0	23	0	0	109	
Oxelosund	20	31	12	7	0	12	0	0	—	
Kalmar	25	27	3	0	0	3	0	0	86	
Roytaa	1	31	31	31	0	0	0	31	809	
Oulu	1	31	31	31	0	0	29	2	581	
Yxspihlaja	1	31	31	31	0	0	31	0	—	
West Norrskar	10	31	9	0	2	6	0	0	—	
Vaasa	1	31	31	31	0	14	17	0	327	
Mantyluoto	22	31	6	0	0	4	1	0	—	
Mariehamn	28	29	2	0	0	2	0	0	31	
Turku	17	31	15	8	0	11	0	0	154	
Helsinki	17	31	15	7	1	10	0	0	188	
Viborg	1	31	31	31	0	9	22	0	—	
Leningrad	1	31	21	14	4	10	10	0	272	
Tallin to Ostrov Wormisaar	27	27	1	0	0	0	0	0	—	
Pyarnu	3	31	16	6	8	10	4	0	80	
Riga	18	31	14	6	1	8	0	0	91	
Ventspils	18	30	10	1*	0	0	0	0	—	
Kleipeda	18	30	12	0	12	1	2	0	—	
Kiel	27	27	1	0	0	0	0	0	—	
FEBRUARY 1961										
Lulea	1	28	28	28	0	0	0	28	1033	
Skelleftea	1	28	28	28	0	0	0	28	—	
Bredskar (Umea)	1	27	22	0	0	1	17	0	—	
Alnosund	1	20	20	20	0	20	0	0	490	
Sandarne	1	20	20	19	0	1	19	0	—	
Stockholm	1	28	28	23	3	26	0	0	119	
Roytaa	1	28	28	28	0	0	0	28	—	
Oulu	1	28	28	28	0	0	0	28	—	
Yxspihlaja	1	28	28	28	0	0	28	0	—	
West Norrskar	1	13	9	0	7	8	0	0	—	
Vaasa	1	28	28	28	0	1	27	0	406	
Mantyluoto	1	6	2	0	0	1	0	0	—	
Turku	1	19	13	4	6	5	0	0	189	
Helsinki	1	12	11	0	5	3	0	0	230	
Viborg	1	28	28	28	0	0	28	0	—	
Leningrad	1	26	26	19	7	7	19	0	—	
Pyarnu	1	28	28	28	0	0	28	0	99	
Riga	1	2	2	0	0	0	0	0	94	
Kleipeda	2	28	8	0	8	4	0	0	—	
MARCH 1961										
Lulea	1	31	31	31	0	0	24	7	1159	
Skelleftea	1	31	19	15	0	6	11	0	—	
Bredskar	2	25	10	0	1	5	0	0	—	
Stockholm	1	11	11	0	11	11	0	0	88	
Roytaa	1	31	31	31	0	0	0	31	—	
Oulu	1	31	31	31	0	0	12	19	—	
Yxspihlaja	1	31	31	31	0	0	31	0	—	
Vaasa	1	31	31	31	0	6	25	0	451	
Viborg	1	31	31	31	0	5	26	0	—	
Leningrad	10	31	20	0	20	20	0	0	—	
Pyarnu	1	22	16	5	7	4	10	0	80	

* Doubtful Report

CODE:

A First day ice reported
B Last day ice reported
C No. of days that ice was reported
D No. of days of continuous landfast ice
E No. of days of pack-ice
F No. of days dangerous to navigation, but assistance not required
G No. of days assistance required
H No. of days closed to navigation
I Accumulated degree-days (°C)†

† These figures give a rough measure of first the probability of the formation of sea ice, and later the progress of the growth of the thickness of the ice. They are derived from observations taken at 0600 G.M.T., and are the sum of the number of degrees Centigrade below zero experienced at this time for each day during the period of sustained frost.


ICE AT END OF MARCH 1961
Arctic Circle
Greenland observations for 30th March unless otherwise stated.
Aerial reconnaissance 27th Mar, 3rd Apr
Many bergs, see bottom inset.
See top inset
Compiled in the Marine Division of the Meteorological Office
KEY
Open water
Lead
Polynya
New or degenerate ice
Very open pack-ice [⅒-⅜ inc.]
Open pack-ice [⅜-⅝ inc.]
Close or very close pack-ice [⅝-⅞ inc.]
Land-fast or continuous field-ice [⅞][no open water]
Ridged ice
Rafted ice
Puddled ice
Hummocked ice
[The symbols for hummocked and ridged ice etc. are superimposed on those giving concentration]
Y Young ice [2"-6" thick]
W Winter ice [6"-6½' thick]
P Polar ice [> 6½' thick]
A suffix to Y,W,P, indicates the predominating size of ice floes
s small [11-220 yd.]
m medium [220-880 yd.]
b big [½-5 miles]
v vast [> 5 miles]
c ice cake [<11 yd.]
— Known boundary
*** Radar boundary
--- Assumed boundary
Limit of visibility or observed data
Undercast
Few bergs [<20]
Many bergs [>20]
Few growlers [<100]
Many growlers [>100]
Radar target [probable ice]
Position of reporting station
Note:- The plotted symbols indicate predominating conditions within the given boundary.
Shaded areas without a boundary line indicate estimated data.
Close pack ice
All known ice
Iceberg situation during March 1961 with limits of ice.
Key
—Max. limit of all known ice.
Max. limit of close pack.
Min. limit of close pack.
Denotes number of bergs sighted during month
Denotes number of radar targets reported in that 1° 'square' during month.

easterly off Labrador, tending to consolidate the pack-ice and impede its southward movement. Towards the end of March, Arctic air replaced the air from southerly latitudes over the Barents Sea.

Baffin Bay, Davis Strait and the Canadian Archipelago

Very little information continued to be available for this area but there appears to have been no reason for any significant changes since the end of February (except those due to the

seasonal increase of solar radiation). The numbers of icebergs moving southward off Labrador increased and they appear to have been slightly more numerous than normal.

GREAT BANK

The number of icebergs carried into the Great Bank appears to have been above normal, but their main tracks were displaced westwards and the southward penetration was well north of the extreme limit for March.

The area of pack-ice was approximately normal but displaced westwards with an extensive area south of Newfoundland. This pack-ice was pressurised and consolidated against the Newfoundland coast.

GULF OF ST. LAWRENCE, ST. LAWRENCE RIVER AND ESTUARY

There was much open water in the Gulf of St. Lawrence towards the north coast, in the centre of the Gulf, and along the west Newfoundland coast—but conditions were very severe for shipping. Pack-ice continued to drift south and south-eastwards out of the Cabot Strait. Many harbours and the St. Lawrence River were obstructed by jamming caused by the break-up of the ice.

EASTERN GREENLAND

Areas of fast- and pack-ice north of 70°N appeared normal, although they had increased south and east of Scoresby Sound and remained well below normal south of the Arctic Circle.

Numbers of icebergs observed moving southwards were mainly moderate. (Almost all land stations reported less than 50.)

SPITZBERGEN, BEAR ISLAND AND AREAS NORTH OF ICELAND

Bear Island and coastal areas of west Spitzbergen were free of pack-ice; this is unusual for the time of year. The edge of the very open pack off Greenland approached Jan Mayen and north-west Iceland.

BALTIC SEA

By the end of March the Baltic Sea was almost free of ice and the clearance was well ahead of normal, but dangerous ice remained in the north and north-east of the Gulf of Bothnia.

G. A. T.

LOCUSTS AT SEA

In past years, many Selected and Supplementary Ships have recorded in their meteorological logbooks the sighting of locusts at sea. Many of these sightings were reported by radio at the time to the Desert Locust Survey at Nairobi. Whether reported by radio or not, the narratives have always been extracted and forwarded to the Anti-Locust Research Centre in London. Articles referring to the need for such reports appeared in *The Marine Observer* of January 1951 and April 1955 and, in the January 1960 number, Miss Z. Waloff, the Principal Scientific Officer at the Centre, mentioned that these reports had added to their knowledge of swarm movements and had often helped in the assessment of current plague situations. They had also raised some interesting problems relating to locust migrations.

The Centre plans to start a more ambitious locust and weather plotting project this year on an international scale. At their request, the maritime nations assembled at the Third Session of the Commission for Maritime Meteorology (World Meteorological Organisation) at Utrecht in 1960 agreed to encourage ships of their nationalities, operating in the seas around Africa, Arabia, India and Pakistan, to help.

Whenever, therefore, locusts are sighted—whether singly or in a swarm, whether alive or dead—ships are asked to report the occurrence by radio, giving the following particulars:

(*a*) Date and time (specifying GMT or Zone time) when locusts first seen.
(*b*) Latitude and longitude, to nearest minute if possible, where locusts first seen.
(*c*) Time and position as above when locusts last seen.
(*d*) Whether dense, thin or scattered swarms, individual fliers, or floating dead locusts, many or few.
(*e*) Colour of locusts (yellow, pink, grey).
(*f*) Wind direction and speed.

The radio message should be addressed to:

TELEX 24364—ANTILOCUST LONDON

and passed through the long range shore station at Portishead. No further address or preamble is necessary and the cost of the message will be borne by the Desert Locust Information Service, 1 Princes Gate, London, S.W.1.

Specimen messages could read:

TELEX 24364 ANTILOCUST LONDON
12TH 1030 GMT 18.05 NORTH 39.33 EAST TO 1215 GMT 18.32 NORTH 39.18 EAST THIN SWARM YELLOW LOCUSTS STOP WIND NORTHWEST 15 KT

TELEX 24364 ANTILOCUST LONDON
7TH 0310 GMT 28.47 NORTH 50.31 EAST TO 0335 GMT 28.55 NORTH 50.27 EAST MANY FLOATING DEAD RED LOCUSTS STOP WIND VARIABLE 5 KT

All cases of a locust sighting should be recorded in the additional remarks pages of the meteorological logbook (it may be possible in a narrative to give fuller details) together with a statement as to whether a radio message was sent or not.

The following information is intended to help shipmasters and officers in making out their reports.

(1) An adult desert locust is about 2½ inches long with a wing span of about 5 inches. It is rosy-red or brownish-red when immature and bright yellow when ready to breed.

(2) Locusts occur in swarms sometimes of several millions which have been known to extend over more than a hundred square miles. They are capable of hundreds of miles continuous flight and have repeatedly been seen in flight at sea, off the north-western coasts of Africa, and over the Arabian Sea, the Red Sea, Gulf of Aden and Persian Gulf. In 1955 many ships reported the invasion of the Canary Islands by locusts, from which swarms a few stragglers reached the Irish Coasts and the Scilly Isles.

(3) The nomenclature used in reports should be as follows:

(*a*) Isolated locusts = seen in flight singly.
(*b*) Locust groups = flying locusts seen intermittently in numbers.
(*c*) Swarm = flying locusts seen continuously in numbers, over a period of at least a minute.
(*d*) Dense swarm = obscuring part of horizon or other background.
(*e*) Locusts appearing on board.
(*f*) Floating dead locusts.

L. B. P.

PORT METEOROLOGICAL AGENTS AT PERTH/FREMANTLE AND SYDNEY

(This note has been received from the Australian Director of Meteorology.)

Captain John Watson has been appointed to the new post of Port Meteorological Agent for Perth and Fremantle. He commenced his duties there earlier this year.

Captain Watson is a highly qualified master mariner and holds an Extra Master's as well as a Foreign Going Master's Certificate. He was a ship's observing officer before World War II, and during the war completed a course in meteorology with the R.A.F. under a British Meteorological Office instructor as part of the training for Instructor in Flying Training and Navigational Schools. Captain Watson also served for some years as First Grade Pilot for the Port of Rangoon.

The Bureau is fortunate in securing a mariner of Captain Watson's experience and standing to inaugurate the Port Meteorological Agency at Perth/Fremantle serving reporting ships on the Indian Ocean routes. It is expected that as a result of Captain Watson's efforts, we will see a big improvement in ships' weather

reports from the Australian 'area' of the Indian Ocean (south of 15°S between 70°E and 95°E; south of 10°S to the east of 95°E).

It was announced in the last number of *The Marine Observer* that a Port Meteorological Agent had been appointed for Sydney. This officer is Mr. R. W. Simmons. He has had very long experience at sea, covering the period 1919 to 1958. A retired shipmaster (12½ years), he has held a Foreign Going Master's Certificate since 1929. During the war years he served with the Royal Australian Navy as a Lieutenant-Commander.

Mr. Simmons has been very interested in meteorology in the past, and during his many years at sea has been responsible for ships' weather observing and reporting.

The Bureau has been most fortunate in obtaining the services of Mr. Simmons, as with his experience of weather observing and general marine knowledge he should provide most valuable assistance to reporting ships calling at Sydney.

PRESENTATION OF BAROGRAPHS

As stated in the October 1960 number of *The Marine Observer*, special long-service awards, in the form of inscribed barographs, were awarded by the Director-General of the Meteorological Office in 1960 to Captain N. C. H. Scallan, R.D. (Canadian Pacific Steamships), Captain C. L. Carroll, D.S.C., R.D. (Shaw Savill Lines), Captain J. G. Bradley, R.D. (Cunard Line) and Commodore R. G. Rees (New Zealand Shipping Co.).

Four of these special long-service awards are made annually, and each year an endeavour is made to arrange that all four presentations be arranged at one and the same time. But the vicissitudes of the shipping industry are such that this is rarely possible. This year, for a variety of reasons, it was only possible to present one barograph at a time, and consequently each presentation was made in a rather informal manner.

Captain Scallan's barograph was presented to him by Mr. B. C. V. Oddie, B.SC., Deputy Director of Services of the Meteorological Office, in the court room of the *Wellington* (Headquarters ship of the Honourable Company of Master Mariners) on 12th October. As there was an informal technical discussion aboard the ship that evening, many members of the Honourable Company were able to witness the presentation to Captain Scallan, who was accompanied by his wife. Senior representatives of the Canadian Pacific Steamships Ltd. were also present, together with members of the Marine Division of the Meteorological Office. Prior to the presentation, Captain and Mrs. Scallan visited the Meteorological Office and saw something of the work of the Marine Division and the uses to which observations made aboard ship are put.

The presentation to Captain Carroll was made by Sir Graham Sutton, C.B.E., D.SC., F.R.S., Director-General of the Meteorological Office, in the conference room at Victory House (Kingsway) on 4th January. Captain Carroll was accompanied by his wife, and various senior members of the Meteorological Office staff were present, including Commander C. E. N. Frankcom, the Marine Superintendent. During the tea that followed the presentation, Captain and Mrs. Carroll had the opportunity of discussing various meteorological questions with Sir Graham Sutton and his colleagues. Later, Captain and Mrs. Carroll paid a visit to the London Forecast Office, where they were able to see ships' observations being plotted on synoptic maps, and the meteorologist preparing his forecast.

Commodore Rees's barograph was presented to him by Mr. Oddie aboard his ship the *Rangitane* in the Royal Albert Dock, London, on 27th February 1961. Mr. Oddie was accompanied by Commander Frankcom and by Mr. Matheson, the Port Meteorological Officer in London. Senior representatives of the New

Zealand Shipping Co. Ltd. were present; also Mrs. Rees and some of the officers of the ship. After the presentation the visitors were entertained to luncheon.

It was not until 23rd March 1961, that it was possible to make arrangements to present the barograph to Captain Bradley. The presentation in this case was made aboard his ship, the *Arabia*, by Commander Frankcom, who was accompanied by Captain Radley, Port Meteorological Officer in Liverpool. Senior officials of the Cunard Steam-Ship Co. Ltd. were present, together with some of the officers of the *Arabia*. After the presentation the visitors were entertained to luncheon aboard the ship. C. E. N. F.

WEATHER CHARTS AVAILABLE AT LIVERPOOL

To meet the request of many shipmasters sailing from Liverpool, daily weather charts for shipping can now be obtained from the Custom House, Liverpool. These charts can be collected daily, Monday to Saturday inclusive, from 10.30 a.m. onwards. They cover Home Waters, and the eastern North Atlantic to 35°W, between 40° and 67°N. They consist of a weather chart for midnight the previous night, a forecast chart for midnight of the day of issue, and statements of the general synoptic situation forecast for the next 24 hours, gale warnings in operation at the time of issue, and a forecast for the Merseyside area and Manchester Ship Canal.

Liverpool thus now enjoys a service similar to that which has for many years been available to ships leaving the Thames, which are supplied with weather charts by the pilot at Gravesend.

Book Reviews

Die rätselhafte und 'unheimliche' Naturerscheinung des 'explodierenden' und des 'rotierenden' Meeresleuchtens—eine Folge lokaler Seebeben? [*The mysterious and weird phenomenon of 'exploding' and 'rotating' phosphorescence of the sea—an effect of submarine earthquakes?*] By Kurt Kalle. 9½ in. × 7 in. pp. 77. *Illus.* Extracted from *Deutschen Hydrographischen Zeitschrift*, Vol. 13, No. 2, 1960.

This review has been kindly written for *The Marine Observer* by Dr. J. A. C. Nicol, of the Marine Biological Association of the U.K. at Plymouth.

Luminous seas have been known since antiquity, and strange hypotheses have been erected to account for the phenomenon. At the beginning of the nineteenth century, it became generally recognised that luminescence in the sea was produced by marine organisms, either by unicellular plants, or animals of many kinds. In addition to the more usual accounts of phosphorescent or 'milky' seas, there now exist many descriptions of a complex luminous phenomenon known as the 'phosphorescent wheel'. The author has collected 70 reports—64 from *The Marine Observer*—of this phenomenon and offers an explanation of their significance. The descriptions seem to fall into two types: exploding and rotating luminescence. The light appears suddenly at the sea surface, travels rapidly, disappears as suddenly, and is often very bright. It does not seem to be subject to external forces, and it has the appearance of exploding fireworks and parallel or rotating luminous waves. Some accounts speak of luminous balls shooting up from the depths, others of a luminous haze lying above the surface of the sea.

Kalle argues that these phenomena are evoked by submarine earthquakes. Statistical analysis shows that the majority of records are from seismically active areas, especially the Arabian Sea and Indian Ocean.

Seismic shock curves, originating in the sea floor, will travel upwards to the sea surface in an expanding cone. In their passage, they will stimulate luminous organisms, thus producing the exploding type of luminescence and the rapidly ascending 'luminous balls'. At the surface the primary shock waves spread out circularly. In shallow waters, shock waves, reflected downwards from the surface and upwards

again from the bottom as secondary waves, will interfere with the primary waves, producing intensification when in phase, and weakening when out of phase. Various interference patterns that could result are considered at some length. These wave patterns are responsible for the propagated rotating or parallel luminous waves, which sometimes travel with high velocity.

Geographical and seasonal variations are noted. The exploding type seems to occur only in the southern part of the Arabian Sea; the rotating types, in shallow waters (Gulf of Aden, Persian Gulf, etc.). This seems to support the idea of interference effects. Seasonal differences may be due to variations in the abundance of luminous planktonic organisms.

The sea surface cannot be regarded simply as a potentially luminous screen, like a cathode ray face, ready to light up whenever shock waves impinge upon it. The organisms are patchy in distribution, and each species has its own form of response, which may be a fraction of a second, or many minutes. Moreover, luminous responses are subject to fatigue, and a rest or recovery period may be necessary before a second or subsequent flash may supervene. These factors must interfere with any patterning superposed by external stimuli, such as shock waves. Finally, in *Pyrosoma*, at least, the luminous flash itself acts as a stimulus, setting up a chain reaction whereby the light of one animal affects others. *Pyrosoma* is a large animal,* occurring in shoals, and is probably responsible for some reports of luminescence in tropical seas. It is unlikely that this luminous response could be propagated at anything like the speed suggested by the maritime reports, but it does introduce another complicating factor. In trying to make a contribution to this subject, the biologist is hampered by lack of identifiable material. No animals have been collected, and probably little is known about the seasonal variation of the species concerned. If it were possible to preserve a plankton sample or, in the case of large *Pyrosoma*, a slice of the animal, say in surgical spirits, for later identification, there would be a definite gain biologically.

Note. We were particularly pleased to receive Dr. Kalle's paper, which we believe to be the first collection of ships' observations of the phosphorescent wheel to be published. Readers will note that a large proportion of these are from British ships, as published in *The Marine Observer*. Observations of the phosphorescent wheel are still desired from ships, for only continuous observation of the phenomenon in all its varied forms will ever enable the experts to give a satisfactory explanation.

Voluntary observers at sea who are interested in this subject may borrow a copy of the paper, and a translation of it, from me.—*Editor.*

Frontiers of the Sea, by Robert C. Cowen. $9\frac{1}{4}$ in. × $6\frac{1}{4}$ in. pp. 307. *Illus.* Victor Gollancz, Ltd., London, 1960. 25*s.*

This is one of the most readable scientific books the reviewer has had the pleasure of studying. It reads as easily as a novel and appears to be very accurate. It seems an admirable book for imparting non-mathematical knowledge to both laymen and experts and could have been written only with a wide and thorough knowledge of the sciences associated with the sea.

The first chapter traces the history of oceanography, putting into perspective the work of pioneers like Maury, and the great voyages of H.M. ships, particularly that of H.M.S. *Challenger* completed in 1876. The author describes the great increase in interest in oceanography brought about by World War II and the recent International Geophysical Year (I.G.Y.).

Chapters II to IV are mainly geological and give an absorbing account of the topography and geological history and structure of the sea bottom. The use of atomic decay techniques to investigate marine geological history is discussed at length, and a geological timetable is given covering a period of six thousand million years. This section concludes with a discussion of the origins of life which were in

* 'Large animal' in a marine biological sense is a relative term, and would refer to an organism between about 1 in. and 2 ft. in length.

the sea. A detailed account follows of the characteristics of the sea bottom with the history of its investigation and its geology. The reviewer found accounts of the extent, the mysteries of their formation, and the role played by the great ocean deeps of particular interest (e.g., the great depth of the Marianas Trench of 36,000 ft. is a value difficult to comprehend). This part of the book is concluded with an account of the methods of surveying the bottom of the sea. Sampling of the material composing the sea bed by means of long tubes, acoustical surveys, gravity and heat flow measurements are all described.

Finally there is an interesting discussion of the geological history and formation of coral reefs, which shows how recent work in the Pacific tends to confirm Darwin's early theories.

Chapters V to VII are concerned with physical oceanography. The first part of the section deals with waves, including wind waves, i.e. sea and swell, tidal waves and long-period surges. Their modification by variations in the sea bottom, and the way in which they produce coastal erosion, are all considered. Examples of the catastrophic effects of the enormous power of waves are graphically described. The author next considers the general current circulation of the oceans.

Upwelling and interesting new discoveries concerning deep sub-surface counter currents below the Gulf Stream are discussed. One item of particular interest mentioned is the easterly flowing Cromwell Current which has been traced for 3,500 miles across the Pacific south of the equator, terminating near the Galapagos Islands. The current, which is almost entirely below 100 ft., has its maximum velocity at 300 ft. It is 250 miles wide and extends over a depth of 700 ft. and has a mean speed of $3\frac{1}{2}$ kt. This current on average transports more water than the Gulf Stream off Florida and must play a significant part in exchanges of water masses in the Pacific.

In Chapter VII the mighty heat engine made up of the oceans and the atmosphere working together is considered, and the sea is likened to an enormous flywheel. It is pointed out that the sea can feed back its energy into the system efficiently, only when it is overturned. The rate at which this is carried out controls the rate at which the atmosphere can be modified by the sea. This leads the author to discuss climatic change, and the influences upon climate of atmospheric carbon dioxide and fluctuations of solar radiation. The causes of ice ages, and associated variations in the levels of sea and land, are discussed, including the theories of two famous past members of the Meteorological Office—Sir George Simpson and the late Dr. C. E. P. Brooks.

The remaining part of the book is devoted mainly to life within the sea. Plankton, deep sea fishes, their methods of reproduction and the effects of environment on evolution and habits, are all interestingly discussed. One biological phenomenon of particular interest mentioned is the deep sound scattering layer within the seas which frequently extends for hundreds of miles, and which it is suggested is due to thousands of tiny marine organisms.

In the last chapter the author looks into the future. He feels that the International Oceanographic Congress of 1959 was a turning point in the rise of interest in oceanography. It endeavoured to sustain the interest created by the I.G.Y. One important project arranged at the Conference was the survey of the Indian Ocean—the least known of all the major seas. He appears to believe that exciting developments are likely to take place from the descent of man into the great deeps. Piccard's bathyscaphe is described and discussed at length, as well as the more versatile ships of the future.

The book at 25*s*. is very good value, and its diagrams are adequate. There are few photographs, but they are of a high standard: some are probably unique.

G. A. T.

IN LIGHTER VEIN

Our Sparks he knows just what to do
And sends oodles of obs per CQ
But our met. observations
Don't reach all the stations
Perhaps it should read 'bateaux tous'.

Anon.

[We found this poem in the meteorological logbook of a ship which was at the time bound from Panama to Tahiti, and in an area which at present has no detailed radio station.]

Personalities

RETIREMENT.—CAPTAIN D. R. MACFARLANE, D.S.O., O.B.E., retired on 5th April last, after nearly 51 years at sea, 46 of which were served with the Blue Star Line.

David Rattray Macfarlane, who was born in New Zealand, commenced his sea-going career in 1910 with the Union Steam Ship Company. He then went into sail and made his longest voyage of six months and one day from New Caledonia to Glasgow.

Captain Macfarlane joined the Blue Star Line in August 1915 and was promoted to Chief Officer in 1917. At the age of 22, he was serving in the *Brodmede* when she was torpedoed and shelled by a submarine in September of that year, but the ship managed to reach Gibraltar safely.

He was given his first command, the *Celtic Star*, at the age of 26 and later served in many of the company's ships. At the outbreak of the Second World War he commanded the *Imperial Star*. In 1940, while he was in command of the *Auckland Star*, his ship was sunk by enemy action off the south-west coast of Ireland, without loss of life. He was then appointed to command the *Melbourne Star*, which was engaged for the Malta Convoys, and for his services as Commodore of one of these convoys he was awarded the O.B.E. "By his steadfast and resolute behaviour during enemy attacks he set a high standard. It was largely due to his leadership that the operation was successful", stated the official citation.

In August 1942 Captain Macfarlane again sailed in command of the *Melbourne Star* to Malta in convoy. The Government's official account of that voyage was called "The Classic Convoy". Continuous heavy enemy attack was suffered, but Captain Macfarlane took his ship safely to Malta, at times through blazing oil on the sea surface, but, unfortunately, with the loss of 40 lives. For this gallant voyage he was awarded the D.S.O., being one of the first three shipmasters to receive this award.

In September 1943 he was given the command of the *New Zealand Star* and in 1945 successfully evaded a French Vichy cruiser.

In 1947 he was appointed to command the *Argentina Star*, and resumed the company's passenger service to South America on that ship's maiden voyage. In 1950 he was appointed to the *Paraguay Star* which he commanded, except for one voyage in the *Imperial Star* to New Zealand, until he retired.

Captain Macfarlane's first meteorological logbook came from the *Imperial Star* in 1937. Since then, in 14 years, he has sent in 25 logbooks, 6 of which were classed 'excellent'. He received an Excellent Award in 1958.

Captain Macfarlane is now transporting plants and fruits in his garden and navigating a ball round a golf course. We wish him health and happiness in his retirement.

J. C. M.

RETIREMENT.—CAPTAIN W. B. TANNER, R.D., retired on 9th February last, after 46 years at sea, 37 of which were spent in the service of the Cunard Line.

William Butler Tanner served his apprenticeship with the Clan Line, his first ship being the *Clan MacEwan* in February 1915, but most of his apprenticeship from 1916 to 1919 was spent as a Midshipman R.N.R. in Grand Fleet Destroyers.

After passing for 2nd Mate in 1919 he returned to the Clan Line, and remained there until passing for Master and Extra Master in 1924. He then joined Cunard Line as 3rd Officer of the *Aurania*.

Being a regular Reserve Officer, Captain Tanner served in the Navy throughout the Second World War. He was a Commander in Fleet Minesweepers during the earlier years, being promoted to Captain R.N.R. in June 1943, and latterly served as Naval Officer in Charge, Cochin (India), a naval base specially prepared for the final stages of the war against Japan in the Far East.

Returning to the Cunard Line after the cessation of hostilities, Captain Tanner was appointed to his first command, the *Samson*, in 1948. He subsequently commanded *Sibley Park*, *Vandalia*, *Asia*, *Andria*, and spent the last few years of his service in command of *Arabia*.

By his retirement the Meteorological Office loses one of its more senior voluntary observers, for it was as long ago as 1925, when he was in the *Scythia*, that we received his first meteorological records. In his 21 years of observing he sent us 76 records, 36 of which were classed 'excellent'. He received an Excellent Award in 1929, and in 1957 was presented with an inscribed barograph in recognition of his long and zealous voluntary service to the Meteorological Office.

We wish him health and happiness in his retirement. J. R. R.

OBITUARY.—We much regret to have to record the death, which occurred on 27th February, of MR. A. C. BRAWN at the age of 66. He had for many years been an assistant to the Port Meteorological Officer, London, and was therefore known to a large number of ships' officers.

He had retired from the service of the Meteorological Office in January 1955 owing to ill-health.

Alfred Charles Brawn joined the Air Ministry shortly after being demobilised from the Army after the 1914–1918 war, in which he was wounded while on active service in France. This wound bothered him for the rest of his life.

In 1923 he was appointed to the Marine Division of the Meteorological Office, then at Adastral House, Kingsway, and at times he assisted the officer who visited the ships in the Port of London. When the Port Meteorological Office was opened at the docks in 1930 Mr. Brawn was appointed there as assistant and served there until the 1939–1945 war, when the London port office was closed and he was transferred to the Liverpool office. When the Port Meteorological Office, London, was re-opened in 1945 Mr. Brawn returned there and served until his retirement.

Those who worked with him knew him to be of a cheerful and loyal disposition; he was never defeated by difficulties. C. H. W.

OBITUARY.—We regret to record the death on 9th February at Keyingham, at the age of 79, of CAPTAIN ROBERT EWART DUNN, O.B.E. After retiring from command in the Pacific Steam Navigation Company in 1942, Captain Dunn served the Marine Division of the Meteorological Office as Merchant Navy Agent for the Humber area from 1946 to 1956. A short biographical sketch appeared in the January 1957 number of *The Marine Observer*, after he retired from that post.

We are sure that our regret at his passing will be shared by the many hundred voluntary marine observers with whom he came in contact during his years of faithful service as our agent, and many will remember the valiant beat to windward against deteriorating health which fell to his lot during his last few active years.

We extend our sympathy to his daughter. L. B. P.

Fleet Lists

GREAT BRITAIN (Information dated 22.3.61)

The following is a list of British ships which have been equipped with instruments and which voluntarily co-operate with the Marine Division of the Meteorological Office.

The names of the Captains, Observing Officers and Senior Radio Officers are given as ascertained from the last written returns received. The date of receipt of the last return received is given in the second column. An asterisk indicates a new recruitment, who has not yet sent in a logbook.

All returns received from observing ships will be acknowledged, direct to the ship, by the Marine Superintendent.

The Port Meteorological Officers and Merchant Navy Agents at the ports will make personal calls on the Captains and Observing Officers as opportunity offers, or on notification from the ship at any time when their services are desired.

Excellent awards are made at the end of each financial year. The names of the Captains, Principal Observing Officers and Senior Radio Officers gaining these awards are published each July in *The Marine Observer*.

It is requested that prior notification of changes of service, probable periods of lay-up, transfer of Captain, or other circumstances which may prevent the continuance of voluntary meteorological service at sea, may be made to the appropriate Port Meteorological Officer or Merchant Navy Agent.

Captains are requested to point out any errors or omissions which may occur in the list.

Selected Ships

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Accra	30.12.59	T. E. M. Jenkins	D. W. Cawkwell, G. Williams, R. C. Bairnsfather	J. Stuart	Elder Dempster Lines
Achilles	8.12.60	N. Willis	B. A. Cooper, S. Jones, S. J. Brindle	J. J. Tucker	A. Holt & Co.
Adelaide Star	4.7.60	J. McInnes	P. Hayns, G. Easton, P. Smith	R. Grieves	Blue Star Line
Aden	30.1.61	M. A. Trenfield	P. R. O. Cutmore, W. B. Thomson, M. J. Raven	D. J. Moore	P. & O. Line
Afghanistan	25.1.61	D. Calvert			Strick Line
Afric	22.2.61	R. T. Welch	P. Murchison, J. Gillies, R. Noal	J. Micalef	Shaw Savill Line
Ajana	29.12.60	J. D. Blake	D. F. Williams, J. McWilliams, M. S. Dixon	P. H. Gooding	Trinder Anderson & Co.
Albany	12.9.60	R. D. Jones	D. W. H. Peirce, I. Park, J. S. Barton	G. Gannon	Royal Mail Lines
Albistan	13.2.61	T. Dumont	E. Shaw, A. Macdonald, G. Woolard	P. J. Costelloe	Strick Line
Alsatia	25.7.60	E. A. Irvine	D. Carruthers, P. King, R. Kempton-Campbell	J. S. Bishop	Cunard Line
Alva Bay	29.12.60	R. G. Roberts	E. Thiebe, E. Fehr, A. Philippot	J. P. Christie	Alva S.S. Co., Ltd.
Amalric	*	C. Beck			Shaw Savill Line
Amazon	20.3.61	H. E. Sang	G. Coombe, G. Vale, J. Diaper	F. G. Goodall	Royal Mail Lines
Amber	17.1.61	T. Barry	J. McKinlay, W. Balmer		Gem Line
Andania	1.3.61	A. Bridgwater	F. A. Wood, W. F. J. Musson, B. Newcomb, M. McGoldrick	D. Wilson	Cunard Line
Andes	9.12.60	G. M. Fletcher	C. W. Undall, J. Clark, M. Marcowicz, J. Day	G. Sewell	Royal Mail Lines
Andria	19.12.60	A. E. Austin	P. Holloway, D. Ridley, P. Kendall, R. D. Green	P. Byrne	Cunard Line
Apapa	14.11.60	J. A. Brooke	G. Foxcroft, R. M. Somers, P. J. Ewell	G. I. Gilling	Elder Dempster Lines
Arabia	25.1.61	W. B. Tanner, R.D.	J. S. Jones, K. T. Jones, H. Dormer	T. Sandham	Cunard Line
Arabistan	14.12.60	R. Hodgson	D. Lee, G. Keen, M. Doyle	C. Wallace	Strick Line
Araby	7.3.60	J. Postill	A. F. Hawkins, L. P. Fenner, D. J. Williams	R. Steward	Royal Mail Lines
Arakaka	21.3.61	S. Armitage	E. Fernandes, N. Blackburn, F. Sanchez, T. Lee	D. McRae	Booker Line
Araluen	25.11.60	M. R. Foster	G. T. Colbeck, J. O'Malley, G. K. Geen	T. M. Sherriff	Trinder Anderson & Co.
Aramaic	17.3.61	A. E. Smith	A. F. Wilson, J. T. McMee-Power, M. Hughes	D. H. Beay	Shaw Savill Line
Argentina Star	5.12.60	E. R. Pearce, O.B.E.	P. Daniel, R. Bilton, A. Anthony	A. H. Henderson	Blue Star Line
Argyllshire	17.1.61	T. N. Soane	G. M. McLeod, J. A. Cowie, H. Currie		Clan Line
Armagh	31.10.60	J. F. Wood	J. Tepper, W. Patch, D. Gordon	D. McMeackin	Trinder Anderson & Co.

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Ashburton	25.1.61	H. J. Jones	G. M. Mathison, P. D. Guerrier, J. E. Bentley	L. Fornear	Trinder Anderson & Co.
Aragon	*	T. W. Stevens	F. A. Morton, P. E. Jowers, T. B. Casey, B. Hotter	W. Rallison	Royal Mail Lines
Arlanza	*	F. J. Swallow	M. R. Childs, J. E. Flood, R. Forrester, J. Beck, D. Bell	P. R. Dunk	Royal Mail Lines
Asia	7.3.61	P. W. Silson	I. K. Grindrod, F. Pollitt, B. Pennington	A. Gandon	Cunard Line
Assyria	7.7.60	J. G. Bradley, R.D.	D. Longfellow, L. R. W. Portet, G. A. Newcombe, E. Whitley	B. A. Long	Cunard Line
Athelfoam	3.1.60	W. O. Williams	J. Watt, G. Jacobs, T. R. Harrison	M. Appleby	Athel Line, Ltd.
Athenic	7.12.60	G. Heywood	E. Puddifer, B. Hills, M. Collins	H. Knight	Shaw Savill Line
Athlone Castle	27.2.61	A. G. V. Patey	M. Alford, —. Blythe, —. Gadaly	—. Brew	Union Castle Line
Aureol	7.12.60	T. E. M. Jenkins	G. Newton, J. R. Turner, D. R. W. Reeve	F. W. J. Broomfield	Elder Dempster Lines
Australia Star	22.11.60	C. P. Leighton	J. A. H. Gray, I. Wood, G. Evans	L. Cooper	Blue Star Line
Author	23.9.60	A. H. Thompson	G. L. Jones, J. Macdonald, G. Merrick	A. S. J. Broadbent	Harrison Line
Ayrshire	10.3.61	P. Macmillan	L. A. Bartrip, R. H. Leggatt, M. N. Ure, A. Sillars	D. T. Allen	Clan Line
Bamburgh Castle	12.8.60	M. Doherty	R. Charlton, A. Magrath, M. Edge		W. A. Souter & Co., Ltd.
Bankura	17.10.60	D. C. Murison	R. Noel, H. B. Chambers, R. J. Major	J. Rigg	British India Line
Baron Ardrossan	6.9.60	G. Harris	D. L. Innes, W. Brown, J. T. Rennie	J. Thomas	Hogarth Line
Baron Glenconner	15.2.61	A. MacKinlay, O.B.E.	W. G. Todd, G. S. Hunter, G. Charlton	T. O'Driscoll	Hogarth Line
Barrister	22.11.60	W. L. Sawle	I. Barbour, J. Cubbin, H. Jones, R. Knock	L. Sutton	Harrison Line
Baskerville	21.2.61	R. J. Lungley	P. J. Weaver, R. L. Goodfellow, V. Borlase	R. Thorburn	Runciman Line
Bassano	22.6.60	B. Waldie	A. M. Robertson, R. Jones, A. Clough		Ellerman's Wilson Line
Beavercove	2.8.60	F. W. S. Roberts	G. Colclough, P. Embleton, G. Coton	J. N. Coutts	Canadian Pacific Line
Beaverdell	23.5.60	B. Ford	R. P. Wilman, M. V. P. Doyle, H. A. Jones	G. Adamson	Canadian Pacific Line
Beaverford	7.12.60	L. H. Johnston, M.B.E.	J. Godolphin, C. E. Turner, H. A. Jones	S. Connell	Canadian Pacific Line
Beaverglen	11.8.60	W. J. P. Roberts	D. C. Lumbard, G. Gamblin, J. Grandle-Slignall	D. Todd	Canadian Pacific Line
Beaverlake	27.2.61	G. C. Geddes	R. McLean, B. Brown, M. Pouncey	C. Steatham	Canadian Pacific Line
Benvannoch	4.1.61	J. P. Robertson	G. W. F. Walker, J. Mitchell, R. Gavine	E. Fitzgerald	Ben Line
Birmingham City	24.2.61	J. R. Campbell	D. Simpson, A. N. Couch, A. Johansen, A. F. Ashton	A. B. Pilkington	Bristol City Line
Bishopsgate	8.3.61	H. H. Howey	W. Marnie, W. Whitelaw, R. Jones	D. Galley	Silver Line
Braemar Castle	*	D. W. Sowden	J. Nisbet, A. P. Rea, A. A. Parker, A. G. R. Sutherland	—. Peake	Union Castle Line
Brasil Star	25.11.60	L. Vernon, M.B.E.	J. J. Dover, J. Noyon, A. Carrier	H. Pennington	Blue Star Line
Bravo	30.8.60	J. A. Etches	P. Atkinson, J. Myers, N. Furness, K. Richmond, T. A. Wren	P. Hawkins	Ellerman's Wilson Line
Brisbane Star	21.9.60	M. R. Bremberg	J. Goodlad, L. Graham, G. Westrip, H. Owen	W. Wade	Blue Star Line
Bristol City	16.3.61	J. N. Ramsay	M. J. Winter, N. Childs, A. G. Pound	T. M. Jenkins, M.B.E.	Bristol City Line
British Advocate	3.2.61	J. H. Jones	D. G. Ashurst, A. Woodcock, A. A. Porter, R. A. Scott	D. J. O'Shea	B.P. Tanker Co., Ltd.
British Consul	14.11.60	T. H. Evans	A. A. Beattie, D. G. Downie, M. E. Healey	J. R. Weston	B.P. Tanker Co., Ltd.
British Endeavour	22.2.61	W. L. Pugh			B.P. Tanker Co., Ltd.
British Freedom	*	T. M. Govan	K. Roberts, R. Shaw, S. Mann	C. N. McCreesh	B.P. Tanker Co., Ltd.
British General	24.2.61	C. D. Ayres	G. Missing, O. M. Thomas, D. A. Wood	R. Thorn	B.P. Tanker Co., Ltd.
British Patience	31.1.61	R. E. Bell	R. F. Millsom, D. Rutherford, R. Gutteridge	M. McLoughlin	B.P. Tanker Co., Ltd.
British Resource	21.10.60	J. E. V. Robinson	A. Ireland, L. Mackay, R. Pilley, T. W. Hall	I. Whitehead	B.P. Tanker Co., Ltd.
British Sailor	9.1.61	S. Watson	A. Wilkins. A. E. Sainty, P. Leybourne	R. Steward	B.P. Tanker Co., Ltd.
British Splendour	11.10.60	E. W. Shingler	M. Boyd, R. Ogden, B. Scott, D. Widdison	M. Terry	B.P. Tanker Co., Ltd.
Brittany	8.2.61	J. Chester	P. Bracher, J. Escholme, P. Hunter	P. Balzan	Royal Mail Lines
Bulimba	*	W. E. Davies	M. C. S. Ranson, D. P. Whitton, N. K. Fogley	J. D. G. S. Gallagher	British India Lines
Cairnavon	27.6.60	J. Hogg	J. Liston, A. Andrews, M. Robson	L. D. Smith	Cairn Line
Cairndhu	9.3.61	G. H. Percy	A. J. Quinan, W. Anderson, P. Jeffrey, R. V. Parks	W. D. Grieves	Cairn Line
Cairnforth	8.11.60	J. Hogg	O. Wallace, R. Andrews, M. Murray	D. Hall	Cairn Line
Cairngowan	12.12.60	I. G. Foster	A. Anderson, D. Pageter, J. R. Campbell	E. Johnston	Cairn Line

Caltex Canberra	17.5.60	P. J. Davies	G. E. Hill, B. V. Campbell, J. J. Purchall	K. Tyrrell	Overseas Tankship (U.K.), Ltd.
Caltex Edinburgh	25.7.60	C. M. Edwards	M. J. Woodward, M. F. Windows, J. Watton, C. G. McKenzie	—. Taverner	Overseas Tankship (U.K.), Ltd.
Caltex London	1.11.60	J. Gillies	P. A. Denham, W. P. Bilton, C. D'Aguilar	R. Small	Overseas Tankship (U.K.), Ltd.
Calgaria	6.3.61	J. L. Downie	H. M. Keenan, N. Dalziel, R. McLundie, C. Sheppard	J. Moody	Donaldson Line
Caledonia	21.3.61	D. Blair	D. Barclay, R. Langmuir, W. Balnave	J. McConnell	Anchor Line
Calabar	16.5.60	F. Webber	G. R. Merrill, P. J. Houghton, R. G. Knock	M. Conroy	Elder Dempster Lines
Camellia	*	W. C. Mortimer	W. Keough, E. Hutchinson	O. Collins	J. Robinson & Son
Camito	*	R. W. Lundy, O.B.E., R.D.	P. J. Lane, P. A. Chubb, G. Eades	A. Knight	Elder & Fyffes, Ltd.
Canopic	19.9.60	T. H. Davies	G. E. Dickinson, R. E. Altham, R. G. Griffin	T. Sinnott	Shaw Savill Line
Canton	20.3.61	C. W. Mayne	P. T. Senior, G. W. Whillance, J. Munn	P. Geraghty	P. & O. Line
Cape Clear	13.7.60	T. P. Edge	P. S. Murray, T. Gilmour, W. R. Thomson	J. A. McCabe	Lyle Shipping Co., Ltd.
Cape Franklin	8.8.60	C. G. Mallett	J. McPhedran, H. Quigley, G. McGregor	R. O'Connor	Lyle Shipping Co., Ltd.
Cape Grafton	21.9.60	A. Mackinlay	H. A. Gilman, E. Pittaway, J. Sullivan	C. R. Snelling	Lyle Shipping Co., Ltd.
Cape Sable	*	A. B. Sutherland	E. Pittaway, J. C. Hogg, C. MacLean	C. J. Glass	Lyle Shipping Co., Ltd.
Capetown Castle	2.5.60	J. Trayner	—. Munro, —. Oakley, —. Roskell	—. Shaw	Union Castle Line
Cardiganshire	29.12.60	R. T. Harries	S. Barnes, H. B. Gobey, E. J. Watterson	K. Bent	Glen Line
Carinthia	26.5.60	G. T. Marr, D.S.C., R.D.	R. J. Ogilvy, J. Clemenson, M. C. Bell	J. MacDonald	Cunard Line
Carnarvon Castle	13.9.60	J. P. Smythe, D.S.C., R.D.	A. P. Coghlan, R. Blythe, G. R. Kyte	G. W. Kilminster, M.B.E.	Union Castle Line
Caronia	7.12.60	S. A. Jones, R.D.	A. J. Hutcheson, D. Atkinson, H. Dormer, T. Whitehead	D. Williams	Cunard Line
Carrigan Head	15.11.60	W. A. Haddock, O.B.E.	W. Dallas, R. Copeland, R. J. Crawford	R. M. Stirling	Head Line
Caslon	29.12.60	T. O. Hodgson	J. May, A. N. Macfarlane, I. C. Rollo	W. D. Brown	Runciman Line
Catford	*	E. Clarke	L. Thompson, G. W. Beattie	A. Corkhill	South East Gas Board
Catalina Star	15.11.60	G. J. Bowden	D. Staines, W. Robertson, R. Montgomery	E. Forrest	Blue Star Line
Ceramic	25.1.61	G. Campbell	J. W. Brew, N. J. Case-Green, C. Davis	R. O'Shaughnessy	Shaw Savill Line
Chindwara	3.12.59	M. H. Vincent	A. D. Methven, J. B. Raglan, P. E. Humphrys	A. Nixon	British India Line
Chantala	29.12.60	D. W. Speirs, G.M., R.D.	D. Laverick, B. Biddick	J. W. Field	British India Line
Cheshire	15.11.60	A. N. Williamson	S. J. Goodchild, M. Wood, —. Tully	G. Waller	Bibby Line
Cilicia	24.6.60	D. Barclay	A. T. MacKendrick, R. W. L. Crawford, G. R. Cullen, N. Cameron	J. T. C. Williams	Anchor Line
City of Birmingham	16.6.60	G. R. Jackson	B. C. Crombie, A. A. Ramsden, C. Baxter	E. T. Cohig	Ellerman Lines
City of Brisbane	22.11.60	W. Kerr	A. J. Evans, M. J. Swan, D. M. P. Lynch	G. Barlow	Ellerman Lines
City of Bristol	25.8.58	W. G. McCulloch	J. C. Palmer, L. W. Roberts, D. W. Anderson	J. B. Staniforth	Ellerman Lines
City of Capetown	15.11.60	T. H. Fairhurst	J. G. Stott, J. C. Palmer, A. Wood	E. J. Pleasance	Ellerman Lines
City of Carlisle	13.9.60	E. Fawcett	A. H. Gardiner, N. B. Airey, P. Weldon	M. Leyshon	Ellerman Lines
City of Chester	5.12.60	H. E. Roberts	D. Rattray, G. Greenfell, J. Coles	B. Johnson	Ellerman Lines
City of Coventry	29.12.60	G. Stewart	R. A. Lindsay, W. Paton, D. D. Turner	R. J. Halpin	Ellerman Lines
City of Durham	19.1.61	L. H. King	D. H. Parry, D. Brown, D. T. Lamb, G. Drummond	G. Norton	Ellerman Lines
City of Johannesburg	14.12.60	A. L. Beckett	A. W. Gray, A. Cucksey, T. Mathews, C. Bunt	J. P. Keenan	Ellerman Lines
City of Khartoum	14.12.59	A. Brocklebank	R. C. Edwards, —. Owen, —. Cowap	I. Duthie	Ellerman Lines
City of Liverpool	17.2.61	T. S. Dennis	J. J. Gibbs, R. G. MacMahon, R. L. Cooper	J. Leuchars	Ellerman Lines
City of London	16.1.61	W. S. Doidge	E. R. Finch, L. H. Nel, M. J. Wood	H. Hall	Ellerman Lines
City of Lucknow	30.8.60	B. T. Wortley, R.D.	A. M. Robson, J. Hudson, J. E. Hammond	W. Nash	Ellerman Lines
City of Manchester	19.5.60	P. C. Arthur	W. G. Wilson, J. C. Palmer, L. R. Jones	R. K. Mansfield	Ellerman Lines
City of Melbourne	1.12.60	E. G. Chapman	J. Anderson, W. McGregor, M. J. Swift	D. Sinclair	Ellerman Lines
City of New York	12.1.61	B. E. Hooper	B. W. Noble, A. A. Ramsden, G. T. Taylor, M. Thorp	P. McHugh	Ellerman Lines
City of Oxford	27.2.61	W. G. McCulloch	J. Martin, W. G. Wilson, —. Blanch	E. O'Neil	Ellerman Lines
City of Pretoria	10.3.61	W. A. C. Hannah, O.B.E.	H. Owen, W. G. C. Mitchell, J. F. Hartnack	T. S. Stevenson	Ellerman Lines
City of Wellington	31.1.61	M. L. Hernan, M.B.E.	J. Campbell, I. R. Hopton, J. J. Watson	B. W. Rennie	Ellerman Lines
City of Winchester	20.1.61	T. F. Symons	W. M. Fieldhouse, H. E. Rogers, D. O. Dutfield	J. W. Kenny	Ellerman Lines
City of Swansea	18.7.60	A. R. Horan	H. M. Townsend, W. A. King, B. Norwell	W. Gittens	Ellerman Lines
Clan Brodie	5.9.60	W. H. Dalley	G. R. Spittal, J. J. Grigor, C. A. Wraight	J. B. Sinclair	Clan Line

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Clan Buchanan	4.10.60	J. L. Jones	B. Hockley, G. Allson, W. Marshall	J. Lamb	Clan Line
Clan Campbell	8.2.61	K. C. Simpson	T. S. Aplin, S. M. Grant, W. J. Curwen	R. F. Cole, M.B.E.	Clan Line
Clan Chattan	25.11.60	T. A. Watkinson	B. H. Bowen, J. B. Caley, D. N. Doyne	E. J. Shillabeer	Clan Line
Clan Chisholm	7.11.60	A. G. Beynon	T. J. Edwards, R. O. Wise, R. J. Davidson	R. D. Muir	Clan Line
Clan Davidson	1.12.60	J. P. Dunphy	P. A. Laurie, D. Hedges, K. H. Dann	J. Vaughan	Clan Line
Clan Macaulay	20.1.61	E. W. Jenkin	D. Finlayson, A. R. McIntyre, M. J. Woodhead	J. Loosemore	Clan Line
Clan MacBrayne	19.9.60	C. A. Thomas	R. G. Smith, A. R. Irving, J. D. Shearman	G. Finlay	Clan Line
Clan MacDonald	25.1.61	H. D. T. Lockyer	D. C. W. Wellstead, D. MacMillan, C. W. Hills	D. McNeil	Clan Line
Clan MacDougall	13.2.61	L. Pogson	P. J. Mahoney, F. G. King, D. M. Grant	G. E. Randall	Clan Line
Clan MacIndoe	1.12.60	S. S. Davidson	I. C. Laing, J. K. Robinson, R. Dobie	S. Joyce	Clan Line
Clan MacLaren	24.10.60	D. T. Griffiths	C. F. Knott, W. L. Thomas. B. C. Peat	R. W. Moore	Clan Line
Clan Maclay	31.10.60	J. West	D. Bell, I. A. W. Williamson, C. B. Walgate	D. Gray	Clan Line
Clan MacLean	5.5.60	H. Whitehead	A. MacDonald, E. Taylor, T. E. Jackson, R. Harden	D. Eyre	Clan Line
Clan MacLeod	8.2.61	J. De Garis	R. A. Milne, D. Richards, J. J. Ferguson	E. Sheather	Clan Line
Clan MacTavish	26.1.61	J. V. Findlay	O. I. McMinn, C. W. Gowans, G. R. Hobkirk	W. A. Ellmers	Clan Line
Clan Sutherland	18.7.60	F. H. Turton	J. A. Cowie, M. P. R. Turner, J. A. Swindlehurst	W. Gay	Clan Line
Clan Urquhart	14.9.60	F. B. Parker, O.B.E.	K. S. Burton, T. L. Kirby, J. L. Cameron	J. D. Carroll	Clan Line
Columbia Star	31.1.61	J. T. Lowe	A. J. Fordham, A. J. Chivers, E. Smith	J. Brett	Blue Star Line
Condesa	21.10.60	D. A. Parkin	B. P. Young, J. Batchen, T. E. Thomas	W. Cusick	Houlder Line
Consuelo	22.12.60	F. Metham	F. W. Pickup, B. Gash, P. Ogram	D. Leeson	Ellerman's Wilson Line
Corfu	25.1.61	F. W. J. Pearce	—. Marsland, C. Smylie, I. Nicoll	T. Martin	P. & O. Line
Corinaldo	16.11.60	J. L. McQueen, O.B.E.	D. Campbell, J. MacDonald, I. Chisholm	J. Lamb	Donaldson Line
Corinthic	11.8.60	A. C. Jones	A. Cairns, B. Roberts, A. Henderson	T. Lilith	Shaw Savill Line
Cornwall	13.1.60	I. Y. Batley	D. W. Watt, D. Jamison, P. Hornby	R. Lockwood	Federal Line
Corrales	27.1.60	D. J. Morris	P. A. Best, A. Ditchfield, W. H. Ross	A. Brown	Elders & Fyffes, Ltd.
Cortona	21.9.60	A. L. Hunter	R. S. McLundie, A. T. Johnston, T. M. Cullen	A. Gordon	Donaldson Line
Cotopaxi	22.7.60	E. C. Hicks	A. R. Law, D. C. Steele, R. Davies	M. Garratt	Pacific S.N. Co., Ltd.
Cragmoor	8.3.61	J. P. Hogg	J. R. Fox, J. Campbell, F. M. Arshall	T. J. Kirkpatrick	Runciman Line
Cretic	19.12.60	G. S. Sheldon	J. C. L. Thorowgood, T. M. Ffowes-Williams, L. G. Stewart	H. Burson	Shaw Savill Line
Crystal Bell	8.2.61	R. Martin	R. Bhattacharjee, M. Roberts, G. Ashworth	D. F. Kenny	Sugar Line
Crofter	23.8.60	W. E. Williams	P. G. T. Potter, F. L. Steele, D. J. Smith	A. D. Fraser	Harrison Line
Cuzco	1.3.61	R. B. Bryant	M. J. Ratcliffe, E. Gowland, D. Ellis	V. Dalton	Pacific S.N. Co., Ltd.
Cymric	22.2.61	H. C. Smith	A. Newman, M. Clark, J. Neil, D. Cornish	W. Charlton	Shaw Savill Line
Cumberland	3.1.61	J. E. Bury	A. Batt, J. Cosker, D. Hyde, A. Woods	K. Wilson	Federal Line
Daleby	5.10.60	H. W. S. Finn	J. O'Hara, O. R. T. Ashcroft, A. Anderson		Sir R. Ropner & Son, Ltd.
Darro	7.12.60	A. Barff, R.D.	D. J. Tatham, M. Wardle, B. W. Roberts, J. McCaughrean	E. Barnes	Royal Mail Lines
Debrett	16.1.61	C. E. Legg	P. W. Hughes, A. Kenyon, R. R. Grimer	J. B. Christian	Lamport & Holt Line
Deerpool	20.3.61	J. R. Copping	D. N. McLeod, A. S. Wood, P. Taylor, J. Penn-Davies	N. Docherty	Sir R. Ropner & Son, Ltd.
Delphic	25.1.61	R. Frisby	M. Hollyoak, I. S. McEwan, R. Hetherington, B. Lloyd	S. Williamson	Shaw Savill Line
Deseado	12.12.60	W. S. Thomas	P. J. Smith, R. A. Rogers, J. H. Thompson	P. J. Higgins	Royal Mail Lines
Devon	9.5.60	R. B. C. Brown	A. E. Robinson, T. Gibson, E. H. Beetham	M. Taylor	Federal Line
Devonshire	15.2.61	G. W. Dobson, R.D.	K. Gowsell, J. F. Code, A. P. Coghlan		Bibby Line
Diomed	21.3.61	W. J. Moore, D.S.C., R.D.	S. P. Worsnop, O. L. Harrison, D. A. Watt	E. Roberts	A. Holt & Co.
Discovery II	4.1.61	P. T. Taylor	J. Higham, R. H. Gollop, R. J. Cat	K. R. Mitchell	National Institute of Oceanography
Dominion Monarch	7.3.61	K. D. G. Fisher, G.M.	A. C. Reed, L. Mounsey, P. Ward, A. Saunders	R. Crompton	Shaw Savill Line
Donegal	14.10.60	R. F. Hellings	F. P. Hall, R. Brown, T. Dene	J. Ryan	Trinder Anderson & Co.
Dorset	22.2.61	F. C. Taylor	L. E. Howell, B. Jones, R. Jones, E. M. Brand	T. Hirst	Federal Line
Drina	13.7.60	F. A. C. Thacker	R. Brown, P. J. Towers, J. C. Clarke	G. Clarke	Royal Mail Lines

Dunedin Star	25.10.60	R. H. Stark	C. I. MacKillop, A. Kinghorn, J. Massey	N. Geer	Blue Star Line
Dunkyle	*	W. Furneaux	A. MacDonald, J. McLeod, V. Wallace	T. Kelly	J. & J. Denholm, Ltd.
Durango	7.3.61	R. C. S. Woolley, R.D.	D. Phillips		Royal Mail Lines
Durham	18.7.60	R. Hollingdale	J. Crowder, A. Carver, G. Morris	F. Wilson	New Zealand Line
Eden	20.3.61	G. B. Medleycott	J. C. Jardine, D. S. Guinness, R. F. Burnett	J. Duignan	Royal Mail Lines
Edenmore	15.11.60	A. Wiles	M. J. Ratcliffe, P. Bennison, J. Rutherford	T. Twistleton	Furness Lines
Edinburgh Castle	2.3.60	H. A. Deller	G. J. Oakley, W. Dean, S. Ramsey, C. A. Brown	—. Hodgson	Union Castle Line
Egidia	2.3.61	A. J. F. Colquhoun	D. MacArthur, A. Hutcheon, D. Bisset	P. J. Kelly	Anchor Line
Elmbank	*	A. F. King	D. Christie, I. B. M. Hanson	P. I. Pegg	Bank Line
Elysia	26.1.61	A. J. F. Colquhoun	W. Stockley, J. C. McLarty, J. M. Murray, R. Crump	B. L. Drake	Anchor Line
Empire Star	20.3.61	G. T. King	P. W. Hutchinson, P. R. Trehearne, T. J. Morcon-Harneis	A. Adams	Lamport & Holt Line
Empress of Britain	25.1.61	J. P. Dobson, C.B.E., D.S.C., R.D.	B. J. Scott, N. Hebden, F. Andrews	J. Mann	Canadian Pacific Line
Empress of England	25.4.60	C. L. de H. Bell, D.S.C., R.D.	M. J. Myers, W. P. Embleton, H. A. Jones	P. B. McNab	Canadian Pacific Line
English Star	29.12.60	C. H. Watson	P. V. J. Sanders, E. W. S. Gill, R. A. Young, K. S. Devo	J. F. Fitzgerald	Blue Star Line
Ernest Holt	5.1.61	H. J. Aldiss, R.D.	E. A. Binnington and scientific staff	R. W. J. Gregory	Ministry of Agriculture, Fisheries & Food
Essequibo	4.5.59	A. J. G. Barff, R.D.	—. Brook, —. Campbell, F. Morton	B. Johnson	Royal Mail Lines
Essex	13.3.61	S. W. Andrews	G. Webber, R. Keene, J. Highfield, A. Allen	L. Sutton	
Esso Cambridge	19.1.61	B. Bater	J. G. Bean, R. Hyam, L. Hocking	P. C. A. Enrico	Esso Petroleum Co., Ltd.
Esso Canterbury	29.12.60	J. Warby	J. Hickson, T. F. Gay, J. W. Aalen	K. Pearce	Esso Petroleum Co., Ltd.
Esso Exeter	28.11.60	C. H. Beldon	J. A. Hibbert, M. G. King, D. Allen	D. J. Dooling	Esso Petroleum Co., Ltd.
Esso Manchester	21.3.61	I. W. Smith	B. Siddell, O. Douglas	A. Cathcart	Esso Petroleum Co., Ltd.
Eucadia	3.2.61	W. MacVicar, M.B.E.	A. Johnston, W. Millar, A. Black	A. McPhail	Anchor Line
Explorer	10.2.61	E. A. Bruce	P. S. Burn, J. Craig	J. Steven	Dept. of Agric. & Fisheries for Scotland
Farsistan	8.2.61	R. Connacher	I. L. C. Thomas, F. W. Bush, P. J. Williamson	K. Dusher	Strick Line
Fidra	16.3.61	J. Clark	D. R. Christie, L. J. A. Gibb.		Chr. Salvesen & Co., Ltd.
Flamenco	25.9.59	J. H. Allenby	D. Peachan, P. Barry, D. J. Bishop	J. G. Sherwood	Pacific S.N. Co., Ltd.
Fresno City	10.3.61	J. H. Thornbill	M. J. Hogan, M. G. B. Thomas, J. Chapman	H. N. James	Sir Wm. Reardon Smith & Sons
Gallic	27.9.60	B. Callard	I. Chadwick, J. McLean, J. De Coverley	J. Schuster	Prince Line
Galway	8.2.61	H. G. Chafer	J. F. Holder, H. Goulden, V. C. Owen	J. A. Lynch	Trinder Anderson & Co.
Glenartney	27.2.61	D. C. Evans	M. Price, R. F. Dixon, C. A. Tatham	B. D. Place	Glen Line
Glenfinlas	20.3.61	H. K. Martin	A. N. Stimson, P. S. Carr, M. S. W. Humphrey	D. Storrar	Glen Line
Glenorchy	7.3.61	J. B. Anderson	N. P. Austin, A. Bridson, P. Draisey	P. C. Vaughan	Glen Line
Glenpark	22.2.61	D. McKelvie	J. Johnstone, H. McDonald, H. Munro	S. D. Sutherland	Glen Line
Gloucester	20.10.60	J. S. Laidlaw	M. J. Collins, P. Robertson, J. Whittington, J. Agnew	W. J. Henderson	Federal Line
Gloucester City	31.10.60	E. Irish	M. F. Williams, A. F. Ashton, J. M. Dawson	M. Brett	Bristol City Line
Golfito	6.4.60	G. M. Roberts, M.B.E.	G. H. N. Keysar, D. Howell, L. Tait	P. Kelly	Elders & Fyffes, Ltd.
Gothic	15.11.60	R. G. James, R.D.	R. Dyer, —. Guille, C. Downs, M. Jenkins	B. McGovern	Shaw Savill Line
Graig	16.11.60	R. Dodds	E. W. Reay, —. Jarret, S. Briggs	M. Jagger	Graig Shipping Co., Ltd.
Great City	11.3.60	J. H. Thornhill	A. C. Thomas, E. A. Tickner, R. Croft	H. James	Sir Wm. Reardon Smith & Sons
Haparangi	27.10.60	W. J. T. Stevens	W. Fleming, B. R. Baggott, R. J. Bayliss, D. E. Collick	P. Stephenson	New Zealand Line
Harpalion	21.9.60	A. R. Phelps	R. Fellowes, J. Higham	C. Bason	J. & C. Harrison, Ltd.
Hartington	18.1.60	J. B. Steele	S. K. Middleton, J. H. Brown, G. Gregory	A. R. King	J. & C. Harrison, Ltd.
Hauraki	27.6.60	D. A. G. Dickens	J. Rutherford, A. W. S. Cripps, R. S. Hall, M. J. West	R. J. Hardy	New Zealand Line
Hector	7.12.60	R. A. Hanney	B. G. Lloyd, J. H. Watterson, A. E. J. Coates	A. Torrance	A. Holt & Co.
Hector Heron	*	D. Cornwell	A. Lindsay, B. T. Wood, A. E. Cook, M. Else	W. Campbell	Hector Whaling, Ltd.
Helenus	9.3.61	M. J. Case, M.B.E.	R. Heath, J. B. N. Hodgson, P. A. Leece	A. E. Holman	A. Holt & Co.
Hemiglypta	9.3.61	E. L. Petherbridge	G. A. Mastin, C. C. Waugh, J. Wragg, F. Hutchins, M. Hazzard	C. M. Dunwoody	Shell Tankers, Ltd.
Hertford	14.2.61	H. C. R. Dell	M. Elsam, G. Lowery, F. Michael, P. Richards	W. Kay	New Zealand Line
Himalaya	15.11.60	H. C. S. Slinn	D. G. Banks, I. C. Bayliss, J. C. Vint	R. Hawkins	P. & O. Line

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Hinakura	9.9.60	N. L. Warren	H. Crane, B. Anstey, E. Naisbett, J. Bulkely	R. Jay	New Zealand Line
Hororata	17.1.61	C. P. Robinson	M. Hodgkinson, J. Hannah, R. Ford, R. Bond	J. Hewitt	New Zealand Line
Hubert	25.1.61	J. Whayman, D.S.C. & bar, R.D.	J. P. McClelland, B. J. Connerly, J. Hutchinson, M. Williamson	F. Fitzgerald	Booth Line
Huntingdon	7.11.60	J. D. Guyler	J. Lewis, J. Weston, J. Forest, G. Stalker	N. Fancett	New Zealand Line
Hauraki	20.3.61	D. A. G. Dickens	J. Rutherford, A. W. S. Cripps, J. Mills-Baker, R. Ashton	M. Moore	New Zealand Line
Hyrcania	7.12.60	G. Clarke	C. G. Daniels, F. H. Constantine, G. M. Sutherland	D. Foden	Baltic Trading Co., Ltd.
Imperial Star	25.11.60	G. L. Evans, O.B.E.	R. L. Stringer, D. R. C. McKerrow, R. B. Brisset	D. R. Whitehead	Blue Star Line
Inishowen Head	14.10.60	H. N. Clarke	S. Jamison, W. B. Niblock, D. Nivison	G. McCarrol	Head Line
Innesmoor	29.12.60	W. A. Watson	M. J. Martin, J. Jenkins, R. Storey	J. Macleod	Runciman Line
Interpreter	22.9.60	R. L. Williams	A. J. Moore, B. Crook, P. G. Rylands	D. T. Hawken	Harrison Line
Ionic	27.2.61	R. G. E. Grant	A. K. Jones, —. Gale	L. D. Waterhouse	Shaw Savill Line
Iron Barque	•	D. S. Brady	M. Miller, J. Carr, B. Read	P. Standen	Common Bros., Ltd.
Iron Ore	10.3.61	J. G. Wright	A. D. Jones, R. G. Bell, A. P. Kruum, J. Robertson	V. Griffiths	Common Bros., Ltd.
Ivernia	7.3.61	W. E. Warwick, R.D.	J. W. Smith, M. W. Roberts, J. King	G. Parsons	Cunard Line
Ixion	23.8.60	A. McL. Pilcher	B. Greenwood, P. G. Young, R. Jobson	W. W. Beebee	A. Holt & Co.
Jamaica Planter	19.12.60	T. A. Kidd	M. L. Labistour, A. Maclean, D. Couzens, D. Warwick	A. F. Sheen	Kaye, Son & Co., Ltd.
Jamaica Producer	31.10.60	J. N. Caris	J. Wallace, M. J. Hennessy, J. R. Miles	R. Prole	Kaye, Son & Co., Ltd.
Jason	6.10.60	J. Gould	R. Smith, P. M. Beckett, D. W. Bowker	J. R. Brooksbank	A. Holt & Co.
John Biscoe	22.6.60	W. Johnston	J. L. Pattison, J. C. Russell, R. Percy (Members, Falkland Is. Meteorological Service)	I. Williams	Falkland Islands Govt.
John Holt	15.8.60	R. A. Simpson	J. E. Dunn, G. Guerandel, K. Bridson		Guinea Gulf Line
Journalist	16.11.60	D. Wolstenholme	D. H. Browne, D. Sowden, R. Bell	W. Stirling	Harrison Line
Kenilworth Castle	8.12.60	C. E. Lorains	G. R. Plummer, G. V. Hobbs, R. Flint	M. Hendy	Union Castle Line
Kenuta	27.2.61	D. I. Jones	J. Scott, A. C. Gordon, C. A. Rowntree	N. Roberts	Pacific S.N. Co., Ltd.
Kenya	20.3.61	H. B. W. Cray, M.B.E.	W. H. Orgill, E. G. Rowley, J. Wagstaff, A. D. Methven	J. D. Masterman	British India Line
King Arthur	14.6.60	J. L. Ritch	M. J. Woodhead, K. Fullarton, D. McMinn	J. Wright	Clan Line
King Robert	2.1.61	M. G. Gillen	C. Maciver, C. McCarthy, G. A. Anderson	M. Welbourne	King Line
Koyan	27.8.59	M. F. M. Fair	A. R. Pilliner, D. Montgomery, S. Fox	J. B. Jardine	Henderson Line
Lalande	25.11.60	J. S. Peterkin	R. Ward, R. P. Willis, K. Liddell	J. A. Grierson	Lamport & Holt Line
Laurentia	13.3.61	T. S. Graham	R. S. McLundie, A. D. McCullum, C. Campbell, W. McKee	D. Murray	Donaldson Line
Leicestershire	17.3.61	E. D. Brand	R. M. Ellison, A. G. Broadwith, J. W. Mackinlay	J. E. Unsworth	Bibby Line
Limerick	16.3.61	T. Hastings	W. V. Wood, B. Gardner, P. Wesson, P. Petts	B. J. Williams	Trinder Anderson & Co.
Lindisfarne	29.12.60	G. Robinson	K. Scollay, C. Patterson, F. Torgersen	W. Johnson	W. A. Souter & Co., Ltd.
Lismoria	19.1.61	R. McNie	R. Brewster, W. F. Joyce, H. H. Grant	J. Limpitlaw	Donaldson Line
Livorno	16.2.61	J. E. Wray	J. H. Randall, K. Richmond, R. Jones	D. D. Rocca	Ellerman's Wilson Line
Loch Avon	25.11.60	T. W. F. Bolland	R. J. Peters, J. D. Williams, B. L. Cater	J. Greenhalgh	Royal Mail Lines
Loch Garth	13.4.60	C. C. Dingle	M. Willets, R. Forrester, R. Dole	F. Page	Royal Mail Lines
Loch Gowan	9.9.60	G. S. Grant, R.D.	P. G. Bracher, W. Carruthers, C. Bush	D. Stevenson	Royal Mail Lines
Loch Loyal	22.7.60	F. J. Swallow	S. H. Lewis, M. H. Hobbs, P. H. Barker	J. Barter	Royal Mail Lines
Logna	11.7.60	L. B. Anderson	T. W. Lawrence, G. Reid		Chr. Salvesen & Co., Ltd.
London Pride	10.3.60	J. Wallace	R. J. Smith	B. R. Harvey	London & Overseas Freighters, Ltd.
Laganbank	10.1.61	J. Porteous	G. G. Bruce, J. D. Todd, C. S. Stitt	K. A. Brooks	Bank Line
Macharda	11.11.60	J. Lyle	R. P. D. Williamson, N. F. Grayson, I. R. Poole	J. H. S. Watson	Brocklebank Line
Magdapur	9.12.60	J. G. Nuttall	J. H. Larbalestier, D. A. Evans, M. Donnellin	D. Lawrence	Brocklebank Line
Mahanada	24.6.60	G. A. Jackson	G. M. Kennedy, R. Holland, P. Caville	F. Carter	Brocklebank Line
Mahseer	2.1.61	J. Richardson	T. M. Barratt, P. Slade, T. Williams	P. Wright	Brocklebank Line
Makalla	23.3.60	G. J. Kenyon	P. J. McKiernan, R. E. Roberts, M. C. Tait	E. MacKinnon	Brocklebank Line

Malancha	1.12.60	D. H. Morris	K. T. G. Bell, T. J. Hamilton, A. C. Howie	E. MacVicar	Brocklebank Line
Manchester City	14.12.60	D. G. Thomas	H. W. Norton, P. Humphrey, J. M. Rimmer	W. Wilson	Manchester Liners
Manchester Faith	4.2.60	J. E. Jones	D. N. Wells, D. Barlow, D. Gregson	W. McPherson	Manchester Liners
Manchester Fame	16.3.61	W. Hine	J. Birkenhead, R. F. Muir, O. Selwood, P. Boniface	J. Buchanan	Manchester Liners
Manchester Mariner	16.1.61	M. E. Bewley	J. A. McKay, M. Barnes, C. Spence	M. Doran	Manchester Liners
Manchester Merchant	14.11.60	F. Downing	G. Simmons, N. W. Cockshoot, G. B. Rapp	B. E. Bewlay	Manchester Liners
Manchester Miller	2.8.60	E. W. Raper	P. D. Owen, D. Thomas, A. Copeland	E. Heyward	Manchester Liners
Manchester Pioneer	29.12.60	D. S. Millard	T. V. Hatherall, A. Copeland, R. J. Higgins	T. W. Jones	Manchester Liners
Manchester Port	2.3.61	F. Lewis	K. Hunter, A. Tester, J. Bell	D. Wright	Manchester Liners
Manchester Progress	7.12.60	J. L. McLaren	J. Brock, T. B. Hancock, A. S. Bashford	H. McGowan	Manchester Liners
Manchester Regiment	14.10.60	T. H. Lynn	C. Hogg, J. Illingworth, A. L. Morris	T. Berry	Manchester Liners
Manchester Spinner	15.11.60	E. W. Espley	C. R. Hutchinson, A. Tester, G. Evans	J. Reid	Manchester Liners
Manchester Trader	27.2.61	W. E. G. Oliver	C. N. R. Shinkfield, —. Hancock, —. Kirkham, —. Simmons	D. Hodgson	Manchester Liners
Manchester Vanguard	22.11.60	L. C. Taylor	R. G. Proctor, J. R. Lowe, M. W. Kipling	M. Freemantle	Manchester Liners
Manchester Venture	25.4.60	T. H. Lynn	A. Gow, D. Barlow, G. H. Gleave	H. Harris	Manchester Liners
Mandasor	3.11.60	A. B. Davies	J. D. Read, E. L. Jackson, I. G. H. Foulkes	R. G. Douglas	Brocklebank Line
Marengo	26.1.61	A. Gillis	J. J. Bell, D. Fairfield, P. J. Bludd	C. A. Meade	Ellerman's Wilson Line
Martand	22.2.61	O. Pritchard	R. E. Roberts, C. G. Webster	A. Adams	Brocklebank Line
Matheran	20.3.61	I. A. MacLaren	P. D. Peters, P. R. Owen, W. R. Oldfield	J. Bentley	Brocklebank Line
Matina	10.6.60	B. Hodges	R. Knight, G. Mackie, A. Bateley	D. Baird	Elders & Fyffes, Ltd.
Mauretania	15.12.59	E. A. Divers, C.B.E., R.D.	B. Penington, T. A. Nicholson, J. King, A. T. Cant, P. Walton	J. Connock	Cunard Line
Media	29.12.60	H. J. Chaloner, R.D.	C. R. Lucas, D. J. McManus, D. M. Davies	H. M. S. Williams	Cunard Line
Melbourne Star	21.9.60	A. Penrice	C. A. Flavell, M. Thomas, T. Morcom-Harneis	D. Green	Blue Star Line
Merchant Duke	6.12.60	S. E. Hooper	J. Carr, R. Young, W. Skivington	N. E. Wynne	Drake S.S. Co., Ltd.
Meta	16.3.61	A. D. Macnab	A. Wood, A. Macintyre, H. Thomson	P. Driscol	Glen & Co., Ltd.
Middlesex	22.12.60	I. C. Davidson	A. Lamont, H. Hynard, M. Hill, K. Mulcrew, P. H. Milburn	R. G. Heath	Federal Line
Monarch	25.1.61	O. R. Bates	D. W. Alford, J. Lofts, R. Saitken	R. Pharo	H.M. Postmaster General
Monmouthshire	19.1.61	M. Auchterlonie	J. I. McCrindle, D. R. Stocks, J. J. M. Terry	S. Kershaw	Glen Line
Muristan	14.7.60	R. Mace	W. Hill, N. Wray, D. Robinson, M. Dawson	P. Creed	Strick Line
Napier Star	11.5.60	W. Murphy	J. Newman, E. Bee, B. Peters	A. W. Eakin	Blue Star Line
Naticina	27.5.60	R. E. Annett	W. T. Rogerson, M. J. Hollywell, P. C. Lucy	R. T. Durston	Shell Tankers, Ltd.
Nestor	21.2.61	W. I. D. McMillan	J. G. Johnston, C. J. Boyes, J. Ghest	T. King	A. Holt & Co.
Newfoundland	17.5.60	N. Coubrough	R. W. Holmes, H. Miller, G. Bennett	J. Keegan	Furness Lines
New York City	13.2.61	F. W. Harris	T. Chappell, A. B. Cough, J. Whitcher	W. J. Read	Bristol City Line
New Zealand Star	8.2.61	J. D. W. Davies	A. Moir, C. Churcher, P. Churchill	T. M. Morrison	Booth Line
Nordic	27.2.61	C. Blakey	D. Milliken, G. Morgan, P. Warwick	J. B. Gardner	Prince Line
Norfolk	11.10.60	D. B. Brittain	R. G. J. Davis, E. T. Rowland, D. W. Boys, P. O. Kean, J. S. Dickie	E. Perry	New Zealand Line
Norna	•	C. S. Owen	F. C. Chisholm, D. R. Corse		Dept. of Agric. & Fisheries for Scotland
Norseman	3.10.60	R. B. Riddle	R. Valvona, J. Neil, J. M. Watson	R. Steele	Cable & Wireless, Ltd.
Northumberland	7.12.60	T. Alderman	M. Jackson, D. Smith, W. MacRae, C. Greenwood	B. Percy	Federal Line
Nottingham	7.12.60	H. J. D. Sladen	A. J. Ward, P. J. Sedgwick, J. W. Rice, M. A. Robinson	R. H. Morris	New Zealand Line
Nova Scotia	19.12.60	J. E. Wilson, O.B.E.	H. Miller, D. Osborne, D. Campbell	P. Mahony	Furness Lines
Novelist	9.9.60	C. C. Heaton	B. W. Jones, A. I. McDonald, D. Gibbs, —. Ellison	R. L'Estrange	Harrison Line
Obuasi	2.3.61	N. Taylor	D. Pierce, J. Mosley	T. McGrath	Elder Dempster Lines
Ocean Monarch	•	R. Marshall	R. B. Dickson, T. Avens, P. Miller	J. Hynes	Furness Lines
Orcades	9.2.61	J. D. Birch, D.S.C., R.D.	R. Goddard, D. Swetham, D. Underwood	D. Macrae	P. & O. Line
Orion	15.2.61	R. J. Craddock, O.B.E.	S. M. Harvey, G. B. Robinson, J. H. Booth	F. Harrop	P. & O. Line
Oronsay	29.12.60	R. W. Roberts, O.B.E., D.S.C.	A. D. Henderson		P. & O. Line
Orontes	17.1.61	R. J. Brittain	P. R. Mitchell, J. S. Fitzwalter, R. D. Parkin	W. Clarke	P. & O. Line
Orsova	19.12.60	N. W. Smith, C.B.E.	P. J. V. Paget, J. M. B. Wells, W. J. Denly	P. Parish	P. & O. Line

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Otaio	20.3.61	K. Barnett, R.D.	C. S. Dowse, J. D. Hellings, J. A. Needham, E. Davbeny	R. Broome	New Zealand Line
Otaki	19.1.61	J. D. Bennett	W. E. Lewis, D. Moran, J. Hume, T. Hughes	M. Wood	New Zealand Line
Otra	2.8.60	D. Archibald	D. Polson, E. D. Smith, F. H. Eagle, W. Sinclair		Chr. Salvesen & Co., Ltd.
Oxfordshire	6.2.61	N. F. Fitch, M.B.E.	D. W. Mathews, V. J. Gatis, I. G. Clarke	A. Rodger	Bibby Line
Pacific Envoy	13.1.61	A. H. Cooke	T. A. Tate, G. H. Deere, K. Twyman		Furness Lines
Pacific Fortune	15.6.60	G. Brown	B. E. Pritchard, G. H. Deere, A. J. Davidson	D. C. Bullard	Furness Lines
Pacific Northwest	17.1.61	L. W. Cooper, O.B.E.	A. W. McLaughlan, E. B. Hobson, V. W. Kinley		Furness Lines
Pacific Reliance	27.2.61	J. B. Stewart	L. G. Stephenson, D. Bremner, P. Savage	W. Peddig	Furness Lines
Pacific Stronghold	19.12.60	G. Brown	S. N. Simpson, D. Garside, J. Andrew	A. R. G. Murray	Furness Lines
Pacific Unity	30.11.60	J. L. Sims	M. G. East, A. C. Collop, M. J. Buchanan	R. Barker	Furness Lines
Pampas	29.9.60	T. Fraser	E. N. Kemp, D. Pierce, J. V. Marks, B. Wilson	D. J. Cowhig	Royal Mail Lines
Papanui	2.6.60	M. J. Heron	G. Cherney, J. M. Burn, E. G. Dixon, T. Wright	W. Hall	New Zealand Line
Paparoa	27.6.60	C. Masson	J. E. Sherwood, D. Phantom, M. Hill, A. Jackson	K. Wilson	New Zealand Line
Paraguay	26.9.60	G. C. W. Meldrum, M.B.E., R.D.	D. Bell, M. Mortimer, M. R. Simon	R. Rowe	Royal Mail Lines
Paraguay Star	8.2.61	D. R. MacFarlane, D.S.O., O.B.E.	—. Deckworth, D. R. MacKillop, J. A. Goodlad, J. Parkinson	C. Pennington	Blue Star Line
Pardo	7.3.60	C. Robertson		F. Baker	Royal Mail Lines
Parima	19.7.60	C. D. Ratcliff	V. F. R. Moorman, H. G. N. Lloyd, R. N. Miller	F. O'Callaghan	Royal Mail Lines
Parthia	28.6.60	P. A. Read, D.S.C., R.D.	J. G. Parry, A. S. Black	A. S. O'Sullivan	Cunard Line
Pendennis Castle	2.3.61	H. A. Deller	D. A. H. Howell, I. Munro, N. D. Creaser, W. A. Codrington	P. P. Williams	Union Castle Line
Pennyworth	12.12.60	N. Thompson, M.B.E.	S. G. Medhurst, G. Elwick, W. Young	S. Dingwall	R. S. Dalgleish, Ltd.
Perim	11.11.60	W. H. Waghorn	J. A. Graham, L. Barefoot, D. J. Perry	W. Potter	P. & O. Line
Perseus	9.2.61	W. K. Hole	—. Drummond, —. Smith, —. Robertson, —. Lynsky	—. Hinchliff	A. Holt & Co.
Persic	19.8.60	G. W. Houchen, O.B.E., R.D.	K. M. McLennan, I. P. N. Cameron, W. H. Thomson	W. Peat	Shaw Savill Line
Perthshire	17.3.61	J. Browne	A. M. Ewing, D. Bark, —. Porter, D. Geddes	F. Anderson	Turnbull, Martin & Co.
Pilcomayo	5.9.60	J. M. F. Anderson	R. Sadler, R. Bland, J. Phillip	W. G. Kingston	Royal Mail Lines
Pipiriki	20.9.60	A. B. Stalker	J. B. B. Ashford, G. S. Breen, R. J. Lott	S. L. Adams	New Zealand Line
Pizarro	13.2.61	A. Lang	R. G. Dodsworth, R. T. Riley, W. Jenkins	J. Newman	Pacific S.N. Co., Ltd.
Port Adelaide	24.10.60	E. W. Dingle, M.B.E.	J. Betts, D. J. Campbell, R. Williams	C. S. Hill	Port Line
Port Auckland	25.1.61	C. R. Townshend	D. C. Hebden, M. R. Mortimore, G. J. Botterill	H. Horrocks	Port Line
Port Brisbane	29.12.60	E. E. Roswell	J. D. Cartmell, J. Hart, J. W. Fisher		Port Line
Port Dunedin	8.2.61	A. W. Kensett	J. Lloyd Jones, R. J. Gollogly, S. I. Clough	R. Day	Port Line
Port Fairy	16.1.61	J. A. Newbery	G. M. Jones, K. M. Curnow, R. P. Bisacre	J. P. Hannon	Port Line
Port Hardy	21.10.60	R. L. Hagley	D. R. Clayton, A. G. Broadwith, C. Marton	W. G. Fletcher	Bibby Line
Port Hobart	15.3.61	W. B. Craig	F. J. Carter, J. A. Bramley, K. S. Cruden	T. Cameron	Port Line
Port Invercargill	15.11.60	A. Brown	I. G. Watson, J. Cullen, M. P. Luce	S. Whyte	Port Line
Port Jackson	7.12.60	R. A. Wight	A. H. Hodgson, M. Annett, A. C. Williamson	B. Flinders	Port Line
Port Launceston	23.6.60	V. G. Battle	R. D. Henderson, J. D. Hitchmough, G. Hay	F. V. Harford	Port Line
Port Lincoln	4.1.60	C. J. Gorley	J. M. Bennett, M. Rose, J. Evered, M. Stephenson	G. Foers	Port Line
Port Macquarie	5.1.60	A. J. Braund	I. B. Rankin, C. S. Liley, P. R. Ramsay, T. Steddy	G. Kerr	Port Line
Port Napier	26.7.60	F. J. Lavers	A. G. Ashby, D. H. Kilner, L. Taylor	T. Hargrave	Port Line
Port Phillip	27.4.60	L. W. Cady	P. J. Henley, M. Goddard, J. J. Bannister	M. Coady	Port Line
Port Pirie	10.10.60	L. J. Skailes	C. H. P. Brown, B. M. Le Lievre, R. H. Mitchell	R. Robertson	Port Line
Port Victor	29.8.60	W. Eastoe	D. D. Simpson, J. Bell, J. Dixon	W. Coleville	Port Line
Port Vindex	7.11.60	R. Bettess, D.S.C.	J. Burtt, D. Kissane, W. Watts	N. Hodgeson	Port Line
Port Wellington	14.12.60	C. A. Hodson	P. E. M. Kelway, C. L. Baldam, M. E. Hughes	W. L. B. Hanes	Port Line
Port Wyndham	27.9.60	R. H. Finch	R. R. McMurray, I. Lister, J. R. Hourston	J. S. Clark	Port Line
Potaro	10.3.61	C. Wightman	G. Hunter, C. Earl, I. Berry	R. Passmore	Royal Mail Lines
Potosi	24.10.60	R. D. S. Eckford	M. Quirk, P. Whittaker, D. Outhwaite	C. McCarthy	Pacific S.N. Co., Ltd.

Pretoria Castle	7.7.60	J. D. B. Fisher	—, Robson, —. Ramsay, N. T. Alford	E. H. Pitt, D.S.C.	Union Castle Line
Prospector	14.11.60	E. Whitehouse	J. Watkins, J. Dickesson, K. Jones	M. Murphy	Harrison Line
Queen of Bermuda	*	M. E. Musson	K. Coussons, J. Baston, L. Cuttriss	H. Stennet	Furness Lines
Queensland Star	10.3.61	R. White, D.S.C.	D. Bedford, —. Fells, —. Bremner	T. Maddrell	Blue Star Line
Rakaia	16.2.61	F. G. Bevis	P. Barr, C. Turner, J. Sargent	R. Birkinshaw	New Zealand Line
Ramilles	17.5.60	D. F. Miller	C. Thomas, J. Williams, D. Harries	V. Cottuli	J. Cory & Sons, Ltd.
Ramon de Larrinaga	*	—. Wilson	J. Reid, —. Daniels, —. Rowen		Larrinaga S.S. Co.
Ramore Head	29.12.60	S. T. Ross	D. A. Chinn, N. W. G. Walsh, H. O'Byrne	H. McGurk	Head Line
Rangitane	10.3.61	R. G. Rees	I. M. Green, N. Coupland, M. A. Rabbetts, R. Young	L. Whittington	New Zealand Line
Rangitata	15.3.61	A. Hocken	R. Mair, C. C. Hufflett, C. S. Highfield	W. S. Fowler	New Zealand Line
Rangitiki	12.1.61	P. S. Calcutt	B. D. Lee, W. Davidson, A. Course, G. Martin	C. Lambe	New Zealand Line
Rangitoto	19.1.61	L. W. Fulcher	H. Crane, R. Cooper, R. Ford, D. Butcher	W. Shepherd	New Zealand Line
Rathlin Head	17.10.60	A. Fee	R. Daley, T. McI. Hammill, R. Martin	A. V. Davidson	Head Line
Regent Falcon	17.10.60	J. A. Cresswell	G. Reid, R. J. Peters, R. J. Watton	M. J. Crook	Regent Petroleum Tankship Co. Ltd.
Regent Royal	27.2.61	S. S. Jenkins	C. Carey, L. S. Taylor, R. Fuller, W. C. Cook	M. Hope	Regent Petroleum Tankship Co., Ltd.
Reina Del Mar	21.3.61	J. E. Evans	G. H. Gordon, J. F. Smith, D. Push, I. J. Kelty	T. Hurley	Pacific S.N. Co., Ltd.
Restormel	*	K. Janes	D. Stratford, L. Gresle, L. Fordyce	C. B. Plomer	J. Cory & Sons, Ltd.
Reynolds	22.11.60	J. E. Riekstins	S. Peters, T. Curry, P. D. Owen	D. Smyth	Bolton S.S. Co., Ltd.
Rhodesia Castle	25.1.61	J. B. James	R. G. Clann	R. Cullen	Union Castle Line
Rialto	1.3.61	H. Greenhill	R. Wells, P. Ramsay, A. Cameron	A. C. Gavin	Ellerman's Wilson Line
Richard de Larrinaga	14.11.60	H. F. Rickerman	R. D. Parry, —, Bottomley, W. T. Elliot	H. Preen	Larrinaga S.S. Co.
Richmond Castle	4.7.60	G. D. Fowler, R.D.	A. Millns, G. Grazit, J. Mobsby	T. Bury	Union Castle Line
Ripon	22.3.61	G. Leith	J. P. Wood, A. Glover, A. Smart, D. Kiddell	R. Head	Bolton S.S. Co., Ltd.
Rippingham Grange	17.2.61	J. R. Faulkner	N. T. Trevethan, A. A. Abbott, J. W. Green	T. W. Regan	Houlder Line
River Afton	13.10.60	J. P. Johnson	J. A. Shaw, C. E. Fuller, F. M. Cummings	M. J. Newell	Hunting & Son, Ltd.
Rochester Castle	29.8.60	F. J. Pye, M.B.E.	E. Syring, J. Lane, T. Elbra	R. Page	Union Castle Line
Romanby	29.12.60	T. W. Cameron	K. D. Mowat, G. J. McIntosh, I. J. Randall	—. Dodding	Sir R. Ropner & Son, Ltd.
Romanic	6.7.60	G. C. Murray	A. S. Young, J. H. Porter, K. J. Norris	D. Nichols	Bolton S.S. Co., Ltd.
Roonagh Head	27.1.60	E. G. Davey	R. J. Pledge, F. Best, T. Meagher	G. M. Doran	Head Line
Roscommon	28.10.60	N. Waiter	I. Morrison, J. M. Kirby, R. G. F. Collyns	B. D. Fletcher	Trinder Anderson & Co.
Rowallan Castle	12.1.61	R. M. Wright	A. Parr-Morley, D. Bird, J. D. Tidswell	P. Smith	Union Castle Line
Royal Crown	*	A. Sommerville	C. Leggett, B. P. Brough, G. Sanguine	D. MacGillivray	Hall Bros. S.S. Co., Ltd.
Ruahine	25.11.60	N. A. Thomas	J. N. Barr, A. Aston, M. J. Hawkins, M. C. Cox	G. A. Parker	New Zealand Line
Runa	8.9.58	J. H. Gilfillan	T. Mitchell, R. Kennedy	T. Corless	Glen & Co., Ltd.
Runic	7.11.60	C. W. Sendall	G. A. Pallett, A. J. Saunders, P. E. Revill	A. McMurray	Shaw Savill Line
Runswick	17.3.61	J. S. Pinkney, O.B.E.	D. Lyon, P. Palframan, M. L. Morton, S. Ward	A. N. Marsden	Headlam & Son, Ltd.
Rushpool	19.1.61	J. E. Roddam	K. Harper, C. B. Tingle, J. E. Foreman	E. Williams	Sir R. Ropner & Son, Ltd.
Sacramento	20.1.61	H. Grunnill	A. Smith, M. Robinson, P. Pritchard	L. A. Martin	Ellerman's Wilson Line
St. John	20.3.61	P. W. Groves	R. Greenland, H. Tock, G. Crellin, D. Roberts, G. Duffy	J. E. Conway	South American Saint Line
Sagamore	*	W. F. Swann	J. S. Lawn, D. R. G. Taylor, F. Pearson	T. Scott	Furness Lines
Salamanca	27.6.60	W. A. E. Johnston	B. J. Goodall, B. I. Coppack, J. J. Hurley	R. K. Beard	Pacific S.N. Co., Ltd.
Salaverry	1.6.60	R. B. Bryant	D. Rolph, A. Gordon, E. Pepper	R. Fenton	Pacific S.N. Co., Ltd.
Salinas	8.8.60	P. D. O'Driscoll, R.D.	C. Taylor, P. Litherland, J. Archer	D. Burke	Pacific S.N. Co., Ltd.
Salween	19.1.61	S. Fox	A. B. Ferguson, H. C. Toms, J. J. O'Brien, A. L. Crowe	J. Brown	Henderson Line
Santander	23.9.60	A. S. MacLean	G. Scales, D. Good, L. Halyer	T. Turnbull	Pacific S.N. Co., Ltd.
San Velino	16.3.61	T. R. Bowlerwell, M.B.E.	J. Robinson, S. D. Mayl, J. O. Lucas	J. Reilly	Shell Tankers, Ltd.
San Veronico	30.1.61	F. D. Smith	N. H. Chandler, I. F. Boon, A. J. Andrews	D. R. Richards	Shell Tankers, Ltd.
Sarmiento	31.8.60	J. Pattison	D. Hodgson, J. N. Davidson, T. F. Hill, G. Hunter	J. Gardner	Pacific S.N. Co., Ltd.
Saxonia	29.9.60	J. T. Jones, R.D.	C. J. Burtinshaw, W. B. Seubert, D. H. Howells	E. P. Bishop	Cunard Line
Saxon Star	4.1.61	H. G. Moon	G. Noblet, M. Pheby, R. A. Colebrook	P. Power	Blue Star Line
Scottish Eagle	1.9.60	J. W. Spiller	A. Rawlins, A. Brown, D. Wilson, D. Tooms	R. Dolby	Scottish Tanker Co., Ltd.

Name of Vessel	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Scottish Hawk	24.2.60	A. Mair	H. K. Spawforth, F. H. Yeulett, E. T. Burke	D. Ambler	Scottish Tanker Co., Ltd.
Scottish Star	13.7.60	E. C. Laidlaw	M. Dunn, J. O. White, D. O. Tipping, C. R. Jones	J. W. Barry	Blue Star Line
Seattle Star	7.12.60	L. W. Evans	A. R. Redclift, —. De Sayle, J. Gathercole, J. F. Rowe	E. Nicholson	Blue Star Line
Shackleton	•	D. Turnbull	A. Bosher, J. Martin, K. Archibald	P. Reynolds	Falkland Islands Govt.
Shropshire	22.2.61	A. E. Young	J. W. Waldie, N. J. Rice, J. Routledge	R. D. Brown	Bibby Line
Silverbrook	16.1.61	P. L. Hopkins	J. Exley, L. V. Rees, D. Wood	D. A. Ellison	Silver Line
Silvercrag	25.1.61	C. F. Harfoot	J. Bond, D. Martucci, N. Evans	A. Hamilton	Silver Line
Silverdale	12.1.61	G. F. Chivers, M.B.E.	W. L. G. Frith, M. Baisley, J. H. Cloke	E. Carruthers	Silver Line
Silverlake	16.1.61	J. G. Tew	D. A. Hopkins, P. H. Fellows, A. P. Cattle	A. G. T. Evans	Silver Line
Silversand	13.2.61	M. R. Duke	I. McLean, D. W. Bowen, I. G. Ramsay	E. K. Gray	Silver Line
Sir William Hardy	11.4.60	A. Whittleton	E. Rix	E. Rix	Torry Research Station
Socotra	2.1.61	G. J. Savage	B. Nash, N. MacLean, N. Harker	R. J. Chapman	P. & O. Line
South Africa Star	19.1.61	W. Murphy	D. Bindon, I. Harris, R. Hodder	E. Marks	Blue Star Line
Southbank	9.1.61	B. L. Carnie	L. Illingworth, E. W. Wynness, E. P. Miller	D. Farthing	Bank Line
Southern Cross	24.2.61	L. J. Hopkins	D. A. Statham, S. C. Carr, J. M. Sayers, A. Cansick, P. Bowers, M. A. Hooper	R. R. Gell	Shaw Savill Line
Southern Harvester	8.5.59	L. Bartho	W. Anderson, W. Holba, H. Henricksen	D. Miller	Chr. Salvesen & Co., Ltd.
Southern Opal	24.8.59	A. F. Baikie	H. I. Anson	G. Smethurst	Chr. Salvesen & Co., Ltd.
Southern Venturer	1.6.60	H. Myhre	J. Kerr, D. Jensen, W. N. H. Anderson	J. Smethurst	Chr. Salvesen & Co., Ltd.
Stirling Castle	21.2.61	W. S. Byles, R.D.	T. Murton, M. Fazakerley, N. Beauis, L. O. Roskell	J. Summers	Union Castle Line
Stirlingshire	26.9.60	W. C. Rodger	W. I. R. Ward, E. Ramsay, I. Scott	W. Latus	Turnbull Martin & Co.
Strathaird	19.12.60	W. E. Clay, O.B.E., R.D.	D. Bradley, A. R. Tinsley		P. & O. Line
Stratheden	29.9.60	J. L. Dunkley	I. Gibb, M. J. Brace, A. D. Henderson	P. Maloney	P. & O. Line
Strathmore	5.9.60	L. H. Howard, R.D.	W. M. Lucas, D. Perry, I. G. Aldous	G. Dawson	P. & O. Line
Suevic	•	C. L. Carroll, D.S.C., R.D.	G. Cairns, D. W. Johnston		Shaw Savill Line
Suffolk	19.12.60	S. G. Robinson	B. H. Wood, E. Fawcett, G. Wright	N. Wheeler	New Zealand Line
Sunda	10.3.61	L. Porter	D. R. Ellis, G. Yeatman, J. Meredith, M. Raison	J. Peck, M. Jolly	P. & O. Line
Surrey	7.12.60	A. C. Davies	B. C. Maloney, C. Whale, M. Grover	D. Wither	New Zealand Line
Sussex	8.2.61	J. R. M. Ramsay	P. G. Davis, A. Jackson, M. H. Weston	T. D. Mason	Federal Line
Swiftpool	7.6.60	F. D. Lloyd	M. MacDonald, F. B. Pounder, E. Colin	T. Malocca	Sir R. Ropner & Son, Ltd.
Sydney Star	7.11.60	W. T. Pitcher	C. Street, T. Rees, P. Long	G. Burke	Blue Star Line
Sylvania	19.12.60	W. J. Law, R.D.	R. G. Southern, R. A. Woodall, D. J. N. Atkinson	A. F. Crosby	Cunard Line
Tabaristan	29.12.60	E. C. Thompson	S. T. S. Household, J. Frost, J. Rankin, D. M. Foster, J. B. Dunsmore	J. S. S. MacDonald	Strick Line
Tamele	21.3.61	J. A. Cleater	W. P. Lowthian, D. Slater, R. Clark, D. J. Irwin	T. Ainsworth	Elder Dempster Lines
Tantallon Castle	4.7.60	C. W. Armstrong, R.D.	F. R. Wilson, T. E. Atkinson, J. J. Nighy	C. Rolfe	Union Castle Line
Taranaki	1.12.60	J. Gunning	G. E. N. Holmes, D. M. Mortimer, F. W. Miller	G. S. Cavaye	Shaw Savill Line
Tarkwa	26.4.60	E. Kingan	R. I. Wilson, P. Young, A. MacDonald, F. Povall	R. Seward	Elder Dempster Lines
Tasmania Star	17.6.60	F. N. Johnson, M.B.E.	M. Woodhouse, E. Dyer, P. Sherry	F. Huggett	Blue Star Line
Thelma	26.1.61	R. MacLachlan	J. McColl, A. D. Naismith, J. Dugaid	G. Glass	Glen & Co., Ltd.
Tidecrest	28.7.61	F. J. Anderson	R. A. Kelly, E. J. Best, N. D. Nixon	A. Jones	Ivanovic & Co., Ltd
Tinto	22.11.60	S. H. Bennett, M.B.E.	P. A. Best, T. H. Lewis, A. Phillips	L. Kay	Ellerman's Wilson Line
Toronto City	6.3.61	W. Stoodley	C. R. Bishop, P. Wright, N. Childs	W. Read	Bristol City Line
Trecarne	•	W. Phillips	A. J. Durell, C. D. Abbott, L. E. Quigley	T. Cullen	Hain S.S. Co., Ltd.
Trecarrell	30.12.60	I. M. Price	J. M. F. Barnett, J. R. Darby, J. C. Perkin	F. Curran	Hain S.S. Co., Ltd
Trelawney	14.10.60	H. Gravell	G. R. Crease, E. A. Sprunks, A. J. Washbourne	H. Gilchrist	Hain S.S. Co., Ltd
Trelevan	1.3.61	W. H. Whitaker	D. R. Mitchell, D. L. Lacey, I. W. Sheales	C. Hall	Hain S.S. Co., Ltd.
Trelissick	30.11.60	G. A. McKay	R. C. Lister, A. V. Rowles, A. J. Ardley	F. Salmon	Hain S.S. Co., Ltd.
Trelyon	16.3.61	F. G. Bolton	G. C. Blight, D. C. Penberthy, L. E. Quigley	J. Sweeney	Hain S.S. Co., Ltd.
Tremeadow	25.10.60	L. J. White	J. H. B. Armstrong, E. F. Boyd, D. A. Wilkinson	A. R. Watt	Hain S.S. Co., Ltd.
Tremorvah	10.11.60	C. E. Pratt	J. Merriman, N. Dodson, R. Morris	P. Boulton	Hain S.S. Co., Ltd.

Trevalgan	•	J. Cornish, O.B.E.	J. Johnston, R. Francis, L. J. Antoszewicz	J. Anderson	Hain S.S. Co., Ltd
Trevaylor	•	W. F. Denver, O.B.E.	G. R. Crease, D. C. Penberthy, A. Bollingham	P. Enrico	Hain S.S. Co., Ltd.
Trevean	30.8.60	L. Annett	D. J. Hunkin, R. Morris	C. G. Cluett	Hain S.S. Co., Ltd.
Trevelyan	13.2.61	W. R. Bulmer	J. V. Wallace, F. M. Marchant, D. K. Green	P. M. Taylor	Hain S.S. Co., Ltd.
Trevose	•	E. Stewart	M. Paterson, A. Daniel, J. Cotton	C. Chambers	Hain S.S. Co., Ltd.
Trewellard	•	J. M. Downard	T. H. Hallatt, T. Jewell, G. D. Green	D. Taylor	Hain S.S. Co., Ltd.
Turakina	•	R. Owen	R. Bayliss, C. Miller, D. Watson, K. Mills	H. Hall	New Zealand Line
Tyrone	15.2.61	H. Jones	A. B. McMurray, K. Norris, W. H. Head	R. J. Hutchinson	Trinder Anderson & Co.
Velletia	25.1.61	J. H. J. Hamling, O.B.E.	T. Ingram, R. Wood, G. Dutton, R. Firth	W. Sharkey	Shell Tankers, Ltd.
Venassa	13.2.61	J. C. Nettleship	J. F. Beaufort, C. D. Atkinson, R. A. Blockaby, A. Joynson	J. Savoie	Shell Tankers, Ltd.
Volo	6.9.60	L. R. Stilwell	J. Ball, E. Anderson, G. Setterfield	W. McCarthy	Ellerman's Wilson Line
Wairangi	8.2.61	B. Forbes Moffatt	J. O. Jenkins, J. M. Brew, —. Rees	E. M. J. Priddle	Shaw Savill Line
Waiwera	14.6.60	J. O. Williams, R.D.	C. Wynne-Eyton, S. R. N. Alty, J. Neil	J. Downie	Shaw Savill Line
Wanstead	7.3.61	A. Mudo	M. J. Flanagan, M. King, C. Truman	R. A. Sadler	Watts, Watts & Co., Ltd.
Welsh City	31.10.60	S. Leebetter	A. D. Lightfoot, G. Ellerby, D. E. P. Richardson	K. R. Pearson	Sir Wm. Reardon Smith & Sons
Welsh Trader	2.2.60	H. Neale	J. E. Davies	W. Walker	Trader Navigation Co., Ltd.
Wendover	23.1.61	E. Peirce	D. Bradley, A. Smith, A. Cameron	P. Crawford	Watts, Watts & Co., Ltd.
Westmeath	31.10.60	H. R. Coates	R. J. Atkinson, J. Bryon, P. Boyle	P. O'Riley	Trinder Anderson & Co.
Willowpool	27.2.61	C. H. Churchill	M. A. Bennett, B. Hayward, W. B. Rial, L. J. Chapman	M. C. Foulds	Sir R. Ropner & Son, Ltd.
Windsor	21.9.60	J. Tully	I. MacDougal, A. Brown, J. Boyle	D. K. Parkinson	Watts, Watts & Co., Ltd.
Windsor Castle	•	J. F. Oakley	K. Jones, T. Poole, —. Woodall	R. Pitt, D.S.C.	Union Castle Line
Wokingham	30.11.60	J. C. Lewis	R. A. Hawkes, T. L. Cook, D. J. Vincent	I. M. Rae	Watts, Watts & Co., Ltd.
Woodford	13.2.61	F. Grist	R. C. Paramor, R. Lewis, R. Hensley	J. Cooper	Watts, Watts & Co., Ltd.
Woolwich	22.4.60	J. Cormack	D. Wells, W. Thomson, D. Marshall	C. Roberts	Watts, Watts & Co., Ltd.
Worcestershire	15.2.61	H. Davies	L. D. Smart, J. Butterworth, F. Gurney	D. Alcock	Bibby Line
Yoma	24.10.60	W. Kendall	C. Sinclair, A. J. Milmine, Shwe Tin	I. Thomson	Henderson Line
Zena	3.12.59	L. W. Loose	I. Chisholm, A. Livingstone, W. Steven	P. Driscoll	Glen & Co., Ltd.

Supplementary Ships

Name of Vessel	Last Return Received	Captain	Observing Officers	Radio Officer	Owner/Manager
Aaro	25.1.61	W. White	J. V. Hatfield, R. Cole, —. Maltby	F. Nicoll	Ellerman's Wilson Line
Anna	18.3.60	J. C. Cowie			Mitchell & Rae, Ltd.
Apollo	16.1.61	G. V. Barnes	B. H. Burcher, R. L. Pearce, G. Murphy, R. Barrett		Bristol S.N. Co., Ltd.
Borodino	3.2.61	A. T. Jardine	D. Brackenbury, G. Mitchell, D. Beedle	F. E. Smith	Ellerman's Wilson Line
British Reliance	19.12.60	D. Lyle	D. F. Faulkner, G. Dunn, T. Morris	D. Hall	B.P. Tanker Co., Ltd.

Supplementary Ships (*contd.*)

Name of Vessel	Last Return Received	Captain	Observing Officers	Radio Officer	Owner/Manager
Byland Abbey	29.12.60	T. W. Westerdale	H. Shaw, F. Cooper, P. Holland		Associated Humber Lines, Ltd.
Cape Howe	26.5.60	C. A. Jones	—. Hall, —. Fry, S. Liddell	J. J. Donald	Lyle Shipping Co., Ltd.
Carlo	21.9.60	F. A. Firth	S. A. Gallon, A. Backhouse, —. Jabyers	G. H. Shilson	Ellerman's Wilson Line
Cato	19.1.61	W. Kays	A. S. Phillips		Bristol S.N. Co., Ltd.
Cicero	16.11.60	E. Tyler	L. Gibson, P. L. Willingham, M. Davidson	R. Newton	Ellerman's Wilson Line
Circassia	13.3.61	J. McGill Brown	R. R. Watt, S. C. Bryant, C. R. Cullen, G. Pirie	W. Long	Anchor Line
Clan Lamont	29.11.60	J. W. Charles-Auckland	A. T. Campbell, G. Wilson, M. Birchmore	J. A. Browne	Clan Line
Dartmoor	25.11.60	A. H. Brown	A. Burrell, T. Hall, T. W. Hughes	F. Ryan	Runciman Line
Eastern City	21.9.59	I. Williams	P. A. H. Beckett, A. Redcliff, C. Davidson	E. Willcocks	Sir Wm. Reardon Smith, & Sons
Echo	10.3.61	J. L. Jenkins	G. Sommerfield, B. Martin		Bristol S.N. Co., Ltd.
Edward Wilshaw	20.3.61	R. W. Porter Reynolds	P. F. Silwood, D. O. Ferry, M. Gwyer, M. Humphrey	B. J. M. Holt	Cable & Wireless, Ltd.
Ethel Everard	25.1.61	R. Trethewey	R. Croft, G. Young		F. T. Everard & Sons, Ltd.
Gardenia	6.1.61	J. H. Gray	G. Richardson, E. Hutchinson, S. Hyland	A. Gregor	J. Robinson & Son
Garlinge	*	A. L. Wood	W. J. Jones, C. Spencer		Constants, Ltd.
Glitra	3.10.60	M. Scott	D. Corbett, R. D. McGlashan		Chr. Salvesen & Co., Ltd.
Greathope	30.12.60	R. Cook, M.B.E.	W. Craig	A. Hogg	E. R. Newbigin, Ltd.
Hadrian Coast	7.3.61	W. Wyness, M.B.E.	A. Thain, P. M. Bowie		Aberdeen S.N. Co.
Hudson Deep	14.2.61	J. Gibbons, D.S.C.	P. J. Walters, H. Horsley, A. Ozolins	D. B. Somerville	Hudson S.S. Co., Ltd.
Hudson Firth	31.1.61	A. Crosby	D. Willey, P. Thomas, A. Campbell	G. Bard	Hudson S.S. Co., Ltd.
Kirkham Abbey	14.3.61	H. H. Fox, M.B.E.	G. T. Hall, M. E. Taylor, M. S. Proud, R. Carmichael		Associated Humber Lines, Ltd.
Laksa	*	L. B. Anderson	T. Carnie	H. Mackay	Chr. Salvesen & Co., Ltd.
Lady Denison Pender	11.4.60	G. T. Robinson	P. Clough, P. Watts, E. G. L. Small	J. Otley	Cable & Wireless, Ltd.
Lord Codrington	15.2.61	C. O. Caldcleugh	N. Munce, A. Kamdron, J. Beaumont	N. J. Varnes	Ship's Finance & Management Co., Ltd.
Malmo	19.1.61	M. D. Evans	A. B. Drinkall, K. Blake, A. Smith	O. Murphy	Ellerman's Wilson Line
Menastone	25.11.60	S. F. Sheasby	G. F. Hogg, A. S. Frazer, A. Robertson	R. Taylor	Stone & Rolfe, Ltd.
Milo	19.1.61	E. Jones	J. F. Tremlett, S. Church		Bristol S.N. Co., Ltd.
Mirror	3.2.61	G. Garrett	R. M. D. Wright, P. J. Duff, G. J. Ayrton	J. Kinson	Cable & Wireless, Ltd.
North Britain	21.10.60	J. J. Watson	—. Macrae, —. Fordy, —. Wales	D. Parry	North Shipping Co.
Rookwood	15.2.60	A. Dover	B. C. Tyler, R. G. Johnson, C. R. Lycett	S. M. McFaul	Wm. France, Fenwick & Co., Ltd.
Shuna	16.2.61	T. Henry	R. A. Livingstone, J. D. Macintosh	R. Haig	Glen & Co., Ltd.
Soutra	30.1.61	G. Barrie			Chr. Salvesen & Co., Ltd.
Tana	20.1.61	W. H. Spence			Chr. Salvesen & Co., Ltd.
Tolsta	24.2.61	M. Polson	J. Phimister, W. N. H. Anderson, C. J. Nicolson		Chr. Salvesen & Co., Ltd.
Tremayne	9.3.61	G. Joslin	J. K. H. Munday, D. Loud, M. Cowton	B. Cullinan	Hain S.S. Co., Ltd.
Truro	30.8.60	J. B. Dunkley	D. T. Ran, F. W. Pickup, D. Fairfield, C. Tutty, N. Phillips, C. Main, B. Batty, J. Turley	F. Petch	Ellerman's Wilson Line
Tynemouth	22.12.60	J. Barass	G. Wood, J. H. M. Tickell, J. Parlane	J. O'Regan	Burnett S.S. Co., Ltd.
Uganda	31.1.61	A. E. Baber, O.B.E.	M. W. Pudden, E. A. Oram, J. Carter, R. Newberry	J. Soulsby	British India Line
Warwick Castle	22.2.61	A. E. F. Payne	C. Brown, N. Curd, B. Fry	D. G. Bristow	Union Castle Line
Winga	8.10.59	R. J. McNinch	A. Weir, J. MacLean	A. Corless	Glen & Co., Ltd.
Zinnia	21.2.61	W. R. Hunter	R. Thornton, D. Mustarde	D. R. Uglow	J. Robinson & Son

'Marid' Ships

The following is a list of ships recruited for the observing and reporting of sea temperatures from coastal waters of Great Britain. Captains are requested to point out any errors or omissions in the list.

Name of Vessel	Captain	Owner/Manager
Actuality	D. O'Leary	F. T. Everard & Sons, Ltd.
Adriatic Coast	R. E. Holt	Coast Lines Ltd.
**Alderney Coast*	G. S. Palmer	British & Channel Islands S.S. Co., Ltd.
Amsterdam	A. Greenham	British Transport Commission
**Ariosto*	—. Tognola	Ellerman's Wilson Line
Atlantic Coast	H. J. Cowan	Coast Lines, Ltd.
Blisworth	W. R. Day	Grand Union (Shipping) Ltd.
**Brenda*	J. MacKinnon	Dept. of Agric. & Fisheries for Scotland
Bolton Abbey	H. Aaron	Associated Humber Lines, Ltd.
British Coast	P. A. Johnson	Coast Lines, Ltd.
Caesarea	V. Newton	British Transport Commission
Caledonian Coast	F. Mara	Coast Lines, Ltd.
Cambria	E. A. Bradshaw	British Transport Commission
Cheshire Coast	J. S. Mackinnon	Coast Lines, Ltd.
Claymore	J. C. McKinnon	David MacBrayne & Co.
**Clupea*	J. Jappy	Dept. of Agric. & Fisheries for Scotland
**Corfen*	G. Jeffreys	Wm. Cory & Son, Ltd.
**Cormead*	E. A. Pusey	Wm. Cory & Son, Ltd.
**Cormoat*	A. Metcalfe	Wm. Cory & Son, Ltd.
Corncrake	C. Johnstone	General S.N. Co., Ltd.
Crane	J. Cullen	General S.N. Co., Ltd.
**Darlington*	W. Brown	Associated Humber Lines, Ltd.
Drake	W. Lockhart	General S. N. Co., Ltd.
**Dryburgh*	G. Simpson	G. Gibson & Co., Ltd.
Duke of Argyll	W. N. Greenwood	British Transport Commission
Duke of Lancaster	J. Irwin, R.D.	British Transport Commission
Duke of Rothesay	—. Williams	British Transport Commission
Empire Cymric	R. W. Page	Atlantic S.N. Co., Ltd.
Empire Nordic	—. Paige	Atlantic S.N. Co., Ltd.
Ferryhill	J. Innes	Aberdeen Coal & Shipping Co., Ltd.
Forth	H. A. Matheson	Wm. Sloan & Co., Ltd.
**Fountains Abbey*	F. Wooller	Associated Humber Lines, Ltd.
Fruin	L. Lamont	Wm. Sloan & Co., Ltd.
**Fulham X*	D. Battle	Central Electricity Authority
Golden Dawn	A. Adamson, M.B.E.	A. Adamson, M.B.E.
Grebe	J. S. Likis	General S.N. Co., Ltd.
Guernsey Coast	P. Mears	Coast Lines, Ltd.
**Helmsdale*	J. S. Masson	Northern Trading Co., Ltd.
Heron	E. C. Painter, D.S.C.	General S.N. Co., Ltd.
Hesperus	C. Campbell	Northern Lighthouse Board
Hibernia	E. A. Horspool	British Transport Commission
Hibernian Coast	G. Mearns	Coast Lines, Ltd.
**Iberian Coast*	G. Croxford	Tyne Tees Shipping Co., Ltd.
Innisfallen	T. McVeigh	City of Cork Steam Packet Co.
Isle of Guernsey	F. E. Trout	British Transport Commission
Jade	T. Sculley	Gem Line, Ltd.
Jersey Coast	H. G. Keilit	Coast Lines, Ltd.
Lairdscrest	J. Napier	Burns & Laird Lines, Ltd.
Lairdslock	D. McCormick	Burns & Laird Lines, Ltd.
**Lancashire Coast*	C. A. Hopkins	Coast Lines, Ltd
**Leinster*	J. Williams	British & Irish Steam Packet Co.,
Loch Linnhe	G. Coffey	J. Rainey, Ltd.
Loch Mor	D. G. MacKinnon	David MacBrayne & Co.
Loch Seaforth	J. Smith	David MacBrayne & Co.
**Melrose Abbey*	J. Blackburn	Associated Humber Lines, Ltd.
May	R. Williamson	Northern Lighthouse Board
B.P. Marketer	K. Ross	Shell Mex & B.P.
**Munster*	—. Barry	British & Irish Steam Packet Co.
**Netherlands Coast*	E. Fisher	Tyne Tees Shipping Co., Ltd.
**Ocean Coast*	G. H. Clark	Coast Lines, Ltd.
Olivian Coast	T. S. Stewart	Tyne Tees Shipping Co., Ltd.
Pearl	W. Campbell	Gem Line, Ltd.
Pharos	J. W. Hunter	Northern Lighthouse Board
Pluto	F. Dudgeon	Bristol S.N. Co., Ltd.
Pole Star	W. Walker	Northern Lighthouse Board
**Prince Louis*	H. G. de Chair, D.S.C.	Outward Bound Moray Sea School
Princess Margaret	J. F. D. Hey	British Transport Commission
Princess Maud	W. J. Roberts	British Transport Commission
Rambler Rose	T. Foulkes	Hughes Holden Shipping, Ltd.
**Rollo*	D. A. Stokes	Ellerman's Wilson Line, Ltd.
St. Andrew/St. David	H. H. Coney	British Transport Commission
St. Clair	T. Gifford	North of Scotland Shipping Co.
St. Magnus	L. Mainland	North of Scotland Shipping Co.
St. Ninian	A. F. Ramsay	N. of Scotland & Ork. & Shet. S.N. Co., Ltd.
Sappho	C. Knight	Bristol S.N. Co. Ltd.,
**Scotia*	A. Finlayson	Dept. of Agric. & Fisheries for Scotland
**Silvio*	C. Hansen	Ellerman's Wilson Line
Slieve Bawn	G. R. Gill	British Transport Commission
Slieve Bearnagh	D. A. Ponting	British Transport Commission

* These ships also report wind and weather.

'Marid' Ships (*contd.*)

Name of Vessel	Captain	Owner/Manager
Slieve Bloom ..	G. Buttersworth	British Transport Commission
Slieve League ..	R. I. Griffiths	British Transport Commission
Slieve More	G. Darey	British Transport Commission
•*Spray*	J. Andrews	Ellis & McHardie
Suffolk Coast ..	A. Davison	Coast Lines, Ltd.
•*Teano*	F. Barnard, M.B.E.	Ellerman's Wilson Line, Ltd.
•*Torquay*	G. Youngson	J. & A. Davidson, Ltd.
Thrift	H. J. Tait	Northern Co-operative Society
•*Whitby Abbey* ..	H. Boyes	Associated Humber Lines

• These ships also report wind and weather.

Training Establishments

The following is a list of Training Establishments which submit logbooks, kept by the cadets under training, to the Marine Division.

Establishment	Captain/Superintendent	Last Return Received
Conway, H.M.S.	E. Hewitt, R. D., Capt. R.N.R.	31.11.60
Pangbourne Nautical College	A. F. P. Lewis, C.B.E., Capt. R.N. (Retd.) ..	6.1.61
Reardon Smith Nautical College	J. N. Rose, R.D., Lt. Cdr. R.N.R. (Retd.) ..	8.3.61
Warsash, School of Navigation	G. W. Wakeford, M.B.E.	21.9.60
Worcester, H.M.S.	F. J. R. King, Lt. Cdr. R.N. (Retd.)	21.12.59

Trawlers

The following is a list of trawler skippers and radio operators who voluntarily observe and report those elements of the weather which do not entail the use of any meteorological instruments (irrespective of the vessels in which they sail).

Skipper	Radio Operators	Trawler Owner/Manager
P. D. Abbey	G. A. Brocklesby	Thomas Hamling & Co., Ltd.
E. Anderson	S. Waterman	Hellyet Bros., Ltd.
L. Barker	S. Waterman	Hellyer Bros., Ltd.
T. Booth	J. Jones	Northern Trawlers, Ltd.
V. Buschini, Jnr. ..	P. Brady	J. Marr & Son, Ltd.
E. Chilton	M. McKinnon	Don Fishing Co.
C. Coultas	—	Sir Thomas Robinson & Son
L. Coultas	—	Sir Thomas Robinson & Son
R. Devries	A. Jagger, G. A. Holiday, M. G. A. Shaw	Thomas Hamling & Co., Ltd.
J. Dobson	K. H. Massey	Thomas Hamling & Co., Ltd.
G. Drewery	S. Waterman	Hellyer Bros. Ltd.
J. Dunne	—	J. Marr & Son, Ltd.
G. Eddom	L. Hought	St. Andrew's Steam Fishing Co., Ltd.
A. R. Elder	M. McKinnon	Don Fishing Co.
W. Fletcher	H. G. Pask	Lord Line, Ltd.
J. C. Gibson	E. J. Callicott, K. Ward	Thomas Hamling & Co., Ltd.
J. Glass	M. McKinnon	Don Fishing Co.
A. E. Hall	D. L. Verity	St. Andrew's Steam Fishing Co., Ltd.
C. Harris	P. Best	Thomas Hamling & Co., Ltd.
E. Harris	R. Kay	J. Marr & Son, Ltd.
J. Holmes	D. L. Verity	St. Andrew's Steam Fishing Co., Ltd.
J. Hunt	G. Sheriff, J. Lester	Northern Trawlers, Ltd.
E. J. Johnson ..	E. J. Johnson	Thomas Hamling & Co., Ltd.
W. Joplin	S. Waterman	Hellyer Bros., Ltd.
J. A. Kersey	R. R. N. Laing	Charleson-Smith Trawlers, Ltd.
J. Littleproud	F. Scott	Thomas Hamling & Co., Ltd.
W. March	J. Black	Hellyer Bros. Ltd.
J. H. Miller	D. Radshaw, A. Jagger	Thomas Hamling & Co., Ltd.
J. T. Nunn	G. Bovill	Northern Trawlers, Ltd.
H. Parkinson	E. J. Callicott	Thomas Hamling & Co., Ltd.
F. H. Patmore ..	G. A. Holiday	Kingston Steam Trawling Co., Ltd.
F. Pidgen	J. D. Lester	Northern Trawlers, Ltd.
D. Pougher	P. L. Best	Thomas Hamling & Co., Ltd.
A. Robinson	E. J. Callicott	Thomas Hamling & Co., Ltd.
K. Saul	R. Simms	Kingston Steam Trawling Co., Ltd.
T. Sawyer	M. G. A. Shaw, F. Anderson	Thomas Hamling & Co., Ltd.
T. H. Spall	C. J. J. Youngs	Atlas Steam Fishing Co., Ltd.
S. Sparkes	K. Massey, F. Scott	Thomas Hamling & Co., Ltd.
J. Walker	W. Marshall	Boyd Line, Ltd.
B. C. Wharam ..	L. Hought	St. Andrew's Steam Fishing Co., Ltd.
G. Whur	A. Ramsay	Charleson-Smith Trawlers, Ltd.
W. Wood	A. J. Jagger	Boyd Line, Ltd.
J. W. Wright	J. D. Lester	Northern Trawlers, Ltd.

Light-vessels

Name of Vessel	Masters
Abertay	J. MacDougall Gillies
Bar	E. E. Abbott, N. S. Burns.
Dowsing	H. Price, J. Lewis
East Goodwin	W. E. Harvey, G. A. Alp
Galloper	E. J. Winterflood, W. G. Burroughs
Humber	D. W. Bird, H. V. Fuller
Longstone	T. J. Davis
Lynwell	T. J. Lewis, E. G. Rudd
Newarp	W. E. Fenn, R. J. Middleton
North Carr	G. Rosie
Royal Sovereign	L. V. Dawson, B. J. Key
St. Gowan	H. C. L. Hall, H. Milson
Seven Stones	D. J. Harries, J. Davies
Shambles	A. C. Edwards, C. N. Duff
Shipwash	J. Goldsmith, B. G. Simpson
Skulmartin	J. O'Neill, J. K. Carley
Smith's Knoll	B. E. Cunham, R. E. Say

BRITISH COMMONWEALTH

The following lists give the names of Selected and Supplementary Ships, and the number of Auxiliary Ships where known (i.e., those which only report when in 'sparse areas'), which voluntarily co-operate with meteorological services of the British Commonwealth.

Information for these lists is required by 20th April each year. Information for the January corrective lists is required by 20th October each year.

AUSTRALIA (Information dated 1.9.60)

Name of Vessel	Owner
Selected Ships:	
Aros	Australia West Pacific Line
Bulolo	Burns Philp & Co., Ltd.
Canara	B.I.S.N. Co.
Carpentaria	B.I.S.N. Co.
Charon	A. Holt & Co.
Chupra	B.I.S.N. Co.
Citos	Australia West Pacific Line
Delos	Australia West Pacific Line
Gorgon	A. Holt & Co.
Idomeneus	A. Holt & Co.
Koojarra	Western Australian State Steamships
Koorawatha	McIlwraith McEacharn & Co., Ltd.
Kooringa	McIlwraith McEacharn & Co., Ltd.
Malaita	Burns Philp & Co., Ltd.
Malay	Austasia Line
Malekula	Burns Philp & Co., Ltd.
Mandamor	Austasia Line
Mandowi	Austasia Line
Milos	Australia West Pacific Line
Montmo	Burns Philp & Co., Ltd.
Nellore	Eastern and Australian S.S. Co., Ltd.
Orestes	A. Holt & Co.
Port Melbourne	Port Line, Ltd.
Sarpedon	A. Holt & Co.
Triadic	British Phosphate Commission
Trienza	British Phosphate Commission
Tulagi	Burns Philp & Co., Ltd.
Wanganella	Huddart Parker & Co., Ltd.
Wangara	Australian National Line
Windarra	James Patrick & Co.
Supplementary Ships:	
Delamere	Western Australian State Steamships
Dorrigo	Western Australian State Steamships
Dulverton	Western Australian State Steamships
Kabbarli	Western Australian State Steamships
Koolama	Western Australian State Steamships

CANADA (Information dated 14.3.61)

Name of Vessel	Owner
Selected Ships:	
Baffin	Govt. of Canada
Bluenose	Govt. of Canada
Camsell	Govt. of Canada
C. D. Howe	Govt. of Canada
Cyrus Field	Western Union Telegraph Co.
d'Iberville	Govt. of Canada
Edward Cornwallis	Govt. of Canada
Fort Hearne	Hudson's Bay Co., Ltd.
Imperial St. Lawrence	Caribbean Oil and Transport Co.
Irvingbrook	Carib Co.
Irving Glen	Carib Co.
John A. Macdonald	Govt. of Canada
John W. Mackay	Commercial Cable Co.
Kapuskasing	Govt. of Canada
Labrador	Govt. of Canada
Lakemba	Pacific Shipowners, Ltd.
Lakonia	Donaldson Line, Ltd.
Lord Kelvin	Western Union Telegraph Co.
Montcalm	Govt. of Canada
N. B. McLean	Govt. of Canada
Oriana	P. and O. Line
Porte Dauphine	Govt. of Canada
Sir Humphrey Gilbert	Govt. of Canada
Sir William Alexander	Govt. of Canada
Sungleam	Lorentz S. Lingas
Suva	Pacific Shipowners
Thor I	A. S. Thor Dahl
Thorscape	A. S. Thor Dahl
Thorsgaard	A. S. Thor Dahl
Thorshope	A. S. Thor Dahl
Thorsriver	A. S. Thor Dahl
Waihemo	Union S.S. Co. of New Zealand
Waitomo	Union S.S. Co. of New Zealand
Wolfe	Govt. of Canada
Supplementary Ships:	
Anna Bakke	Knutsen Line
Arcadia	P. and O. Line
Banksland	Hudson's Bay Co., Ltd.
Bonneville	A. F. Klaveness & Co.
Bougainville	A. F. Klaveness & Co.
Bronxville	A. F. Klaveness & Co.
Emerillon	Papachristidis Tankers, Ltd.
Fort Ross	J. R. Cooney
Guernsey	Leighton Shipping Co., Ltd.
Hindanger	Westfal-Larsen & Co.
Indiana	Ameritalia
Key West II	Blaine-Myers & Co., Ltd.
Kristen Bakke	Knutsen Line
Lloyd Bakke	Knutsen Line
Marie Bakke	Knutsen Line
Princess Helene	Canadian Pacific Railways
Rincon Hills	Shell Canadian Tankers, Ltd.
Sunadele	Zurich Shipping Co., Ltd.
Sunbeam	Samulsen Falsen
Sunmoira	Odd Owren, Ltd.
Sunnyville	A. F. Klaveness & Co.
Sunprincess	Princess Shipping Co.
Sunrose	B. Holter Sorensen
Varda	H. Ditlev-Simonsen
Ventura	H. Ditlev-Simonsen
Vigan	H. Ditlev-Simonsen
Whitethroat	Govt. of Canada
William Carson	Govt. of Canada

INDIA (Information dated 25.4.61)

Name of Vessel	Owner
Selected Ships:	
Amra	British India S.N. Co., Ltd.
Andamans	Eastern Shipping Corporation
Bahadur	Asiatic S.N. Co., Ltd.
Bharatmitra	Bharat Line, Ltd.
Daressa	British India S.N. Co., Ltd.
Dumra	British India S.N. Co., Ltd.
Dwarka	British India S.N. Co., Ltd.
Indian Exporter	India S.S. Co., Ltd.
Indian Merchant	India S.S. Co., Ltd.

INDIA (*contd.*)

Name of Vessel	Owner
Indian Pioneer	India S.S. Co., Ltd.
Indian Reliance	India S.S. Co., Ltd.
Indian Shipper	India S.S. Co., Ltd.
Indian Trader	India S.S. Co., Ltd.
Islami	Mogul Line, Ltd.
Jalazad	Scindia S.N. Co., Ltd.
Jaladharma	Scindia S.N. Co., Ltd.
Jaladhruv	Scindia S.N. Co., Ltd.
Jalaketu	Scindia S.N. Co., Ltd.
Jalamanjiri	Scindia S.N. Co., Ltd.
Jalaprakash	Scindia S.N. Co., Ltd.
Jalaputra	Scindia S.N. Co., Ltd.
Jalausha	Scindia S.N. Co., Ltd.
Jalavihar	Scindia S.N. Co., Ltd.
Jaljawahar	Scindia S.N. Co., Ltd.
Kampala	British India S.N. Co., Ltd.
Karanja	British India S.N. Co., Ltd.
Mahadevi	Asiatic S.N. Co., Ltd.
Mohammedi	Mogul Line, Ltd.
Mozaffari	Mogul Line, Ltd.
Nadir	Asiatic S.N. Co., Ltd.
Nicobar	Eastern Shipping Corporation
Pradeep	Dept. of Lighthouses and Lightships, Govt. of India
Rajula	British India S.N. Co., Ltd.
Santhia	British India S.N. Co., Ltd.
Shahjahan	Asiatic S.N. Co., Ltd.
Sirdhana	British India S.N. Co., Ltd.
State of Bombay	Eastern Shipping Corporation
State of Kutch	Eastern Shipping Corporation
State of Madras	Eastern Shipping Corporation
State of Orissa	Eastern Shipping Corporation
State of Tr-Cochin	Eastern Shipping Corporation
Saudi	Mogul Line, Ltd.
Subadar	Asiatic S.N. Co., Ltd.
Umaria	British India S.N. Co., Ltd.
Supplementary Ships:	
Bharatbhushan	Bharat Line, Ltd.
Bharatdeepak	Bharat Line, Ltd.
Bharatraja	Bharat Line, Ltd.
Bharatrani	Bharat Line, Ltd.
Bharatratna	Bharat Line, Ltd.
Bharatveer	Bharat Line, Ltd.
Bharatvijaya	Bharat Line, Ltd.
Indian Commerce	India S.S. Co., Ltd.
Indian Endeavour	India S.S. Co., Ltd.
Indian Renown	India S.S. Co., Ltd.
Indian Resolve	India S.S. Co., Ltd.
Indian Resource	India S.S. Co., Ltd.
Indian Security	India S.S. Co., Ltd.
Indian Splendour	India S.S. Co., Ltd.
Indian Strength	India S.S. Co., Ltd.
Indian Success	India S.S. Co., Ltd.
Indian Tradition	India S.S. Co., Ltd.
Jag Ganga	Great Eastern Shipping Co., Ltd.
Jag Mitra	Great Eastern Shipping Co., Ltd.
Jag Rani	Great Eastern Shipping Co., Ltd.
Jag Tara	Great Eastern Shipping Co., Ltd.
Jala-dhana	Scindia S.N. Co., Ltd.
Jaladharti	Scindia S.N. Co., Ltd.
Jaladhanya	Scindia S.N. Co., Ltd.
Jaladhir	Scindia S.N. Co., Ltd.
Jaladuhita	Scindia S.N. Co., Ltd.
Jaladurga	Scindia S.N. Co., Ltd.
Jalagovind	Scindia S.N. Co., Ltd.
Jalakanta	Scindia S.N. Co., Ltd.
Jalakendra	Scindia S.N. Co., Ltd.
Jalamani	Scindia S.N. Co., Ltd.
Jalamayur	Scindia S.N. Co., Ltd.
Jalamohan	Scindia S.N. Co., Ltd.
Jalamudra	Scindia S.N. Co., Ltd.
Jalapadma	Scindia S.N. Co., Ltd.
Jalaprabha	Scindia S.N. Co., Ltd.
Jalapushpa	Scindia S.N. Co., Ltd.
Jalarajendra	Scindia S.N. Co., Ltd.
Jalavallabha	Scindia S.N. Co., Ltd.
Jalaveer	Scindia S.N. Co., Ltd.
Jalavijaya	Scindia S.N. Co., Ltd.
Jalavishnu	Scindia S.N. Co., Ltd.
Jalavikram	Scindia S.N. Co., Ltd.
Jalavishwajyoti	Western Shipping Corporation, Ltd.
Malika	Asiatic S.N. Co., Ltd.
Rajah	Asiatic S.N. Co., Ltd.
Ranee	Asiatic S.N. Co., Ltd.
State of Andhra	Eastern Shipping Corporation, Ltd.
State of Assam	Eastern Shipping Corporation, Ltd.
Vishwaprabha	Western Shipping Corporation, Ltd.

HONG KONG (Information dated 27.3.61)

Name of Vessel	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Anking	V. R. Woolfe	M. D. Burbidge, R. B. Jackson, C. C. L. Sims	J. P. Asome	The China Navigation Co., Ltd.
Anshun	A. Atkin	I. M. Thomson, F. R. Neal, R. J. Smith	Leung Man Hin	The China Navigation Co., Ltd.
Changsha	W. E. Hargrave	M. W. Lewis, J. Paisley, J. B. P. Blamey	Lai Mou Wah	The China Navigation Co., Ltd.
Chefoo	W. Pollock	D. G. Langdon, C. G. Cocksedge, C. J. Coy	Wai Pun Un	The China Navigation Co., Ltd.
Chekiang	D. W. R. Gash	J. K. Davies, C. J. N. Darch, B. C. Maloney	Choi Pong Cheung	The China Navigation Co., Ltd.
Chengtu	H. Pilling	C. D. Nisbet, W. B. A. Blemings, C. A. Flavell	Omar Ismail	The China Navigation Co., Ltd.
Chungking	J. F. Follett	B. A. Owen, G. M. Adams, G. C. Clark	Wong Woon Man	The China Navigation Co., Ltd.
Clara Jebsen	R. A. D. Nielsen	T. M. Hansen, H. L. Laigaard, N. E. Møller	R. Leong	Jebsen & Co.
Dana	L. Hetland	I. J. Apeland, J. Vespestad, A. G. Horsfjord	Wong Chi Hung	T. H. Nordboe
Eastern Argosy	J. F. G. Fotheringham	J. A. C. Tennant, G. A. Roddam, J. Jenner	A. P. Burns	The Indo-China S.N. Co., Ltd.
Eastern Glory	M. I. Groundwater	A. J. W. Imlach, J. B. Skerritt, R. A. Francis	J. P. Cowman	The Indo-China S.N. Co., Ltd.
Eastern Maid	W. E. Reeve	H. F. Schack, D. N. Greenhalgh, B. T. Scarbrough	R. B. Field	The Indo-China S.N. Co., Ltd.
Eastern Muse	G. Kinley	D. Wilson, P. R. Williamson, A. Goodlad	M. Stephenson	The Indo-China S.N. Co., Ltd
Eastern Queen	J. M. Marshall	J. R. Simpson, G. W. S. Ison, W. J. M. Attrill	J. F. Fitzgerald	The Indo-China S.N. Co., Ltd.
Eastern Saga	R. G. G. Stanton	J. D. Witschi, S. J. Sansom, E. G. Edmondson	E. A. Dunford	The Indo-China S.N. Co., Ltd.
Eastern Star	G. P. Parish	K. Miller, D. M. Cauvin, D. R. Cole	H. F. Brookfield	The Indo-China S.N. Co., Ltd.
Eastern Trader	R. K. Learoyd	I. P. Skipp, J. A. C. Hunter, D. Smith	D. Alexander	The Indo-China S.N. Co., Ltd.
Elsbeth	A. C. Tai	D. Goodwin, Luk Sum	Wong Kam Bui	Shun Cheong S.N. Co., Ltd.
Fengming	A. J. Keddie	L. A. McGowan, A. A. Smith, D. Lee	Chan Man Kit	The China Navigation Co., Ltd.
Fengtien	N. C. Pearson	M. S. Briant, C. G. P. Ogg, J. H. Gunn	Tam Tin Yiu	The China Navigation Co., Ltd.
Foochow	R. E. Brooks	R. B. Jones, R. C. Willy, C. Y. Zia	Leung Shu Fun	The China Navigation Co., Ltd.
Fukien	F. Cunningham	B. W. Bland, M. Irish, D. S. Thomson	Yick Wing Sum	The China Navigation Co., Ltd.
Funing	C. E. Bennett	R. F. D. Pook, T. R. Gilchrist, S. M. Ho	Kwan Hok Chung	The China Navigation Co., Ltd.
Hai Hing	Halvor Andersen	K. Jacobsen, Odd N. Roli, H. Isaksen	Chung Yeuk	Norwegian Asia Line
Hai Lee	E. T. Sørensen	R. Pedersen, R. L. Andersen, Rolf Klingenberg	Chan Wuie Iu	Norwegian Asia Line
Hai Meng	O. Schibsted	E. I. Barane, R. Ness, K. Melbö	Chan Kam Tsun	Norwegian Asia Line
Halldor	N. Soelberg	A. Øverland, T. Eikeland, Ivar Henrik Buer	Magnar Haugen	Norwegian Asia Line
Hallvard	E. Nordendal	A. Grønvik, L. V. Skau, B. M. Nybakk	P. Eikeseth	Norwegian Asia Line
Hanyang	M. D. O'Keeffe	D. R. Owens, T. V. Norman, J. R. Rayner	U In San	The China Navigation Co., Ltd.
Heinrich Jessen	R. Feldtmann	B. Ipsen, L. H. Nielsen, A. Jensen	Leung Tjeuk Shing	Jebsen & Co.
Helios	J. Mikkelsen	R. Andresen, O. Skaugstad, G. Knutzen	Ip Yuk Fai	Norwegian Asia Line
Henrik	O. Holm Andersen	Oleg Olsen, Arne Johnsen, Svere Eikeland	Chiu Tze Kong	Norwegian Asia Line
Hermod	H. Yndestad	P. Bøe, J. Kråkemo, J. Bentzen	Poon Chee Pooi	Norwegian Asia Line
Hervar	A. Lerstang	Odd Andreassen, O. J. Strømsness, A. Jensen	Yen Soong Ling	Norwegian Asia Line
Hew Sang	J. G. Perrin	R. Charter, R. G. Macdonald, Kwok Ping Ying	A. N. Butcher	The Indo-China S.N. Co., Ltd.
Hin Sang	W. G. White	F. G. Christie, R. G. Sanderson, Hsu Chien Szu	P. N. Baker	The Indo-China S.N. Co., Ltd.
Ho Sang	C. Preston	E. Dunbar, W. C. Gardiner, T. Y. Yuen	T. A. O'Donnell	The Indo-China S.N. Co., Ltd.
Hoi Wong	O. Utseth	O. G. Espeseth, R. M. Hemnes, E. Eriksen	M. Amundsen	H. M. Wrangell & Co.
Hop Sang	L. C. Cox	I. F. Kite, R. J. W. Raudon, C. R. Overall	A. P. MacIsaac	The Indo-China S.N. Co., Ltd.
Hunan	K. A. Page	H. C. Swanson, D. T. Hollands, W. Lee	Tsang Pui Leung	The China Navigation Co., Ltd.
Hupeh	M. R. M. Seale	G. W. P. George, D. A. Harper, K. Y. Tso	Cheung Shau Wai	The China Navigation Co., Ltd.
Jacob Jebsen	G. Andersen	K. Kopp, E. Aabenhus, J. E. Thomas	Solomon Lai	Jebsen & Co.
Johore Bahru	I. C. McLaren	J. E. Lyon, Ng Siu King, Li Sang Tung	Ng Kam Kit	Great Southern Steamship Co., Ltd.
Kota Bahru	J. L. Baines	W. Sloan, Leung Yu, Cheung Tung Yin	W. Stevenson	Great Southern Steamship Co., Ltd.
Kuala Lumpur	G. Baxter	G. Cornforth, H. Leighton, D. H. Hulme	P. K. Karkaria	The China Navigation Co., Ltd.
Kwangsi	A. Harper	M. T. Anderson, C. R. Humphry, M. J. D. B. Folley	Shiu Ping Fan	The China Navigation Co., Ltd.
Kwangtung	A. Watson	M. H. A. Swift, T. J. Wilson, I. D. Goddard	Chih Fook On	The China Navigation Co., Ltd.
Kweichow	W. J. Bunney	P. S. Fleming, J. M. Wigham, J. H. Gomersall	Tsim Tung Hang	The China Navigation Co., Ltd.
Lao	B. G. Y. Gronwall	H. M. Lundin, J. F. Lindahl, H. Lundsbjerg	S. K. G. Stommen	Everett S.S. Corporation S/A

Lok Sang	J. H. Thomas	R. W. Gibson, P. Ferrar, J. C. Jones	S. G. Clatworthy	The Indo-China S.N. Co., Ltd.
Michael Jebsen	H. P. Fallesen	S. H. Nielsen, T. Soerensen, J. Truelsen	C. H. Lai	Jebsen & Co.
Mui Hock	O. Antonsen	K. Lein, A. Lervik, J. O. Hildal	Chau Fuk Sze	Sveen Shipping Co., Ltd.
Pakhoi	J. W. G. Wilby	R. J. Shipp, P. Matthews, Y. S. Loh	Ngu Chi Siang	The China Navigation Co., Ltd.
Poyang	J. R. Kidd	D. C. Brockbank, M. L. Block, T. C. Jo	Wan Siu Hung	The China Navigation Co., Ltd.
Sangola	W. R. Popplewell	J. M. Woolcock, D. L. W. Davies, M. J. Tinkler	R. S. Staniforth	British India S.N. Co., Ltd.
Star Alcyone	O. Janson	P. O. Granqvist, B. I. Mansen, N. Forsberg	P. O. Ericksson	Everett S.S. Corporation S/A
Star Betelgeuse	H. O. A. Hellke	S. R. W. Stromberg, S. Hansen	E. B. Ostling	Everett S.S. Corporation S/A
Szechuen	E. H. Histed	J. F. Reilly, W. R. Smith, H. P. Liu	Chan Yeung Choi	The China Navigation Co., Ltd.
Tai Chung Shan	E. C. Thomson	Fung Hoi Kwan, Yu Chi Tai, Ng Chun Mong	Poon Kwong Yee	Shun Cheong S.N. Co., Ltd.
Tai Poo An	C. J. Farren	P. McSweeney, Chan Sai Chung, Kwong Ping	Lee Ho Chung	Shun Cheong S.N. Co., Ltd.
Taiyuan	E. Bruce	N. S. Palmer, D. J. V. Packman, G. W. Lock	Tsin Kwong Loi	The China Navigation Co., Ltd.
Tak Sang	G. C. Taylor	E. E. Ewbank, M. G. Bishop, E. H. Bockling	R. G. Brennan	The Indo-China S.N. Co., Ltd.
Waiwerang	F. Fleischer	H. L. van Dam, J. E. Celosse, W. J. Jongenotter	T. J. Vaarmeijer	Royal Interocean Lines

MALAYA (Information dated 27.3.61)

Name of Vessel	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Bentong	D. A. Betts	I. B. Hunter	Felix Tan Yew Kim	Sarawak Steamship & Co., Ltd.
Benveg	G. N. Nicol	J. R. Muir	J. B. Donnelly	Ben Line Steamers, Ltd.
Bidor	T. V. W. Berry	Zainol Abidin bin Mohd	Bobby Pang Ping Kwai	Sarawak Steamship & Co., Ltd.
Kah Poh	S. J. Harvey	Mohd. Noor bin Lanang	Ismail bin Niksar	Ho Chiang Shipping Co., Ltd.
Katong	H. W. Wilkinson	R. J. Wright, D. E. D. Blazey	Abdul Hamid bin Haji Said	Straits Steamship & Co., Ltd.
Keningau	N. R. Murray	W. M. Evans, C. Rankine	P. V. Abraham	Straits Steamship & Co., Ltd.
Kimanis	W. G. Bradshaw	J. C. Pounder, R. A. Quintal	K. A. Menon	Straits Steamship & Co., Ltd.
Kinabalu	A. D. Watterson	J. C. Hammond, Liew Kon Kiew	B. S. Dahale	Straits Steamship & Co., Ltd.
Kunak	J. M. Harkness	R. D. Nicolson, Peter Ho Kia Tuang	K. M. Pillai	Straits Steamship & Co., Ltd.
Larut	J. Hogg	H. P. Davies	David Lange	Straits Steamship & Co., Ltd.
Marudu	B. S. Sprenger	F. J. A. Scott, Goh Choo Keng	Ash Tosh Das	Straits Steamship & Co., Ltd.
Matang	T. H. Stewart	J. C. Charles	Yue Fook Wing	Straits Steamship & Co., Ltd.
Perak	J. H. Martin	K. L. Edwards	C. R. Gordon	Straits Steamship & Co., Ltd.
Perlis	A. Laythorpe	J. V. Mitchell	Sheri H. Bharucha	Straits Steamship & Co., Ltd.
Recorder	G. H. C. Reynolds	J. D. Hawkins, P. E. Pershky, E. G. L. Small	M. Edmunds	Cable & Wireless, Ltd.

NEW ZEALAND (Information dated 21.2.61)

Name of Vessel	Owner
Selected Ships:	
Kaimanawa	Union S.S. Co. of New Zealand, Ltd.
Kaimiro	Union S.S. Co. of New Zealand, Ltd.
Kaitoa	Union S.S. Co. of New Zealand, Ltd.
Kaitoke	Union S.S. Co. of New Zealand, Ltd.
Kaituna	Union S.S. Co. of New Zealand, Ltd.
Karamu	Union S.S. Co. of New Zealand, Ltd.
Karitane	Union S.S. Co. of New Zealand, Ltd.
Katea	Union S.S. Co. of New Zealand, Ltd.
Kauri	Union S.S. Co. of New Zealand, Ltd.
Kawaroa	Union S.S. Co. of New Zealand, Ltd.
Kawatiri	Union S.S. Co. of New Zealand, Ltd.
Kawerau	Union S.S. Co. of New Zealand, Ltd.
Komata	Union S.S. Co. of New Zealand, Ltd.
Koraki	Union S.S. Co. of New Zealand, Ltd.
Koranui	Union S.S. Co. of New Zealand, Ltd.
Koromiko	Union S.S. Co. of New Zealand, Ltd.
Kowhai	Union S.S. Co. of New Zealand, Ltd.
Kurow	Union S.S. Co. of New Zealand, Ltd.
Kurutai	Union S.S. Co. of New Zealand, Ltd.
Matua	Union S.S. Co. of New Zealand, Ltd.
Moana Roa	New Zealand Govt.
Port Montreal	Port Line, Ltd.
Port St. John	Port Line, Ltd.
Tarawera	Union S.S. Co. of New Zealand, Ltd.
Tofua	Union S.S. Co. of New Zealand, Ltd.
Waikare	Union S.S. Co. of New Zealand, Ltd.
Waimate	Union S.S. Co. of New Zealand, Ltd.
Waimea	Union S.S. Co. of New Zealand, Ltd.
Waipori	Union S.S. Co. of New Zealand, Ltd.
Wairata	Union S.S. Co. of New Zealand, Ltd.
Wairimu	Union S.S. Co. of New Zealand, Ltd.
Waitemata	Union S.S. Co. of New Zealand, Ltd.
Supplementary Ships:	
City of Auckland	Ellerman & Bucknall S.S. Co., Ltd.
Holmburn	Holm & Company

Auxiliary Ships:
New Zealand has 11 Auxiliary Ships.

PAKISTAN (Information dated 1.10.60)

Name of Vessel	Call Sign	Owner
Selected/Supplementary Ships:		
Al-Hasan	AQAN	Mohammadi S.S. Co., Ltd.
Al-Husaini	AQAH	Mohammadi S.S. Co., Ltd.
Al-Sayyada	AQAS	Mohammadi S.S. Co., Ltd.
Anwarbaksh	AQAM	United Oriental S.S. Co., Ltd.
Fatehabad	AQEM	Pakistan S.N. Co., Ltd.
Kadarabaksh	AQBK	United Oriental S.S. Co., Ltd.
Maulabaksh	AQBP	United Oriental S.S. Co., Ltd.
Ocean Endurance	AQBU	Trans-Oceanic S.S. Co., Ltd.
Pakistan Prosperity	AQAZ	Karachi S.N. Co., Ltd.

Auxiliary Ships:
Pakistan has 19 Auxiliary Ships.

WEST INDIES (Information dated 4.4.61)

Name of Vessel	Owner
Lady Denison Pender	Cable & Wireless, Ltd.

METEOROLOGICAL OFFICE

Surface Current Charts of N.E. Pacific

The last of a series of five atlases giving a world-wide coverage of the ocean current circulation has been published by the Marine Division of the Meteorological Office.

The new atlas, numbered M.O.655, and entitled *Quarterly Surface Current Charts of the Eastern North Pacific Ocean*, covers the area north of the equator and from 160°w. to the coast of the Americas.

It is uniform with others of this well-known series and is made up of quarterly charts of :

(*a*) surface current roses ;

(*b*) surface current predominant direction and average rates;

(*c*) surface current vector mean.

These charts have been compiled from observations of surface currents sent to the Meteorological Office by voluntary marine observers in British merchant ships and from observations made in H.M. ships forwarded by the Hydrographer of the Navy. The observations cover the period 1855 to 1952.

The atlas, which is available on free loan to U.K. voluntary observing ships from their Port Meteorological Officers, may be purchased from H.M. Stationery Office at 15s. net (11d. postage).

Obtainable from
HER MAJESTY'S STATIONERY OFFICE
at the addresses on title page or through any bookseller

Meteorological Office (Marine Division) Atlases

The following are published by the Marine Division of the Meteorological Office and may be purchased from the bookshops of Her Majesty's Stationery Office at any of the addresses on the title page. Copies are available for reference by shipmasters and shipowners in the offices of Port Meteorological Officers.

Meteorological Atlases

Monthly Meteorological Charts of the Atlantic Ocean. M.O.483, 1948, reprinted 1959. (60°S–70°N, 80°W–40°E) 180*s.* (post 3*s.* 3*d.*)

Monthly Meteorological Charts of the Western Pacific. M.O.484, 1945, reprinted 1956. (60°S–60°N, 100°E–155°W) (16¾″ × 23¾″) 105*s.* (post 2*s.* 9*d.*)

Monthly Meteorological Charts of the Eastern Pacific. M.O.518, 1950, reprinted 1956. (60°S–60°N, 160°W–60°W) (17½″ × 24½″) 147*s.* (post 3*s.* 3*d.*)

Monthly Meteorological Charts of the Indian Ocean. M.O.519, 1949, reprinted 1959. (50°S–30°N, 20°E–120°E) (16½″ × 22½″) 126*s.* (post 2*s.* 9*d.*)

The above four atlases contain monthly charts of wind, barometric pressure, air and sea temperature, and other meteorological elements including some typical tracks of tropical revolving storms.

Monthly Sea Surface Temperatures and Surface Current Circulation of the Japan Sea and Adjacent Waters. M.O.M.447, 1950. (20°N–47°N, 110°E–150°E) (20″ × 17″) 7*s.* 6*d.* (post 9*d.*)

Monthly Sea Surface Temperatures of Australian and New Zealand Waters. M.O.516, 1949. (50°S–10°S, 100°E–180°) (19¾″ × 12¼″) 10*s.* (post 7*d.*)

Monthly Sea Surface Temperature of the North Atlantic. M.O.527, 1949, reprinted 1950. (30°N–68°N, 80°W–15°E) (19¾″ × 12¼″) 10*s.* (post 7*d.*)

Monthly Meteorological Charts and Sea Surface Current Chart of the Greenland and Barents Seas. M.O.575, 1959. (60°N–80°N, 30°W–120°E) 126*s.* (post 2*s.*)
This atlas contains a generalised surface current chart for the area and monthly charts of wind, barometric pressure, air and sea temperature, and other meteorological elements.

Current Atlases

Currents of the Indian Ocean. M.O.392, 1939, reprinted 1956. (50°S–30°N, 20°E–140°E) (30″ × 20″) 10*s.* (post 7*d.*)

South Pacific Ocean Currents. M.O.435, 1938, reprinted 1959. (60°S–0°, 140°E–70°W) (22″ × 34″) 12*s.* 6*d.* (post 1*s.*)
The above two atlases contain quarterly "current arrow" and "current rose" charts.

Quarterly Surface Current Charts of the Atlantic Ocean. M.O.466, 1945, reprinted 1957. (60°S–70°N, 80°W–20°E) (22½″ × 18″) 32*s.* 6*d.* (post 1*s.* 6*d.*)

Quarterly Surface Current Charts of the Western North Pacific Ocean with monthly chartlets of the China Seas. M.O.485, 1949. (0°–60°N, 98°E–160°W) (21″ × 16″) 25*s.* (post 11*d.*)

Quarterly Surface Current Charts of the Eastern North Pacific. M.O.655, 1959. (0°–60°N, 160°W–65°W) (23″ × 17″) 15*s.* (post 10*d.*)
The above three atlases contain current rose charts, predominant current charts, and vector mean current charts.

Ice Atlases

Monthly Ice Charts of the Arctic Seas. M.O.M.390a, 1944. (60°N–80°N, 80°W–110°E) (12″ × 7″) 3*s.* 6*d.* (post 5*d.*)
Polar ice, mean limits of sea ice, extreme limits of sea ice, extreme limits of bergs.

Monthly Ice Charts of Western North Atlantic. M.O.478, 1944. (37°N–53°N, 72°W–35°W) (12″ × 7½″) 4*s.* (post 7*d.*)
Mean limits of pack, extreme limits of pack, mean limits of bergs, extreme limits of bergs.

Climatological Charts

Climatological and Sea-Surface Current Charts of the North Atlantic Ocean. M.O.615, 1958. (5°S–60°N, 100°W–40E°) (40″ × 25″, folded to 13″ × 8″) 36*s.* the set (37*s.* with folder) (post 1*s.* 2*d.*)
One chart for each month, based on information in M.O. 483, M.O. 466 and M.O. 478 (above).

Her Majesty's Stationery Office

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